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Capacity Assessment Framework to Enhance Disaster Resilience within Kingdom of Saudi Arabia

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ABSTRACT

As a result of growing urbanization and extreme nature of extreme events, threats from various man-made and natural disasters in Kingdom of Saudi Arabia (KSA) are very real. However, recent evidence suggests that various levels of Government and emergency responders are insufficiently prepared to address the increasing demand for disaster response. With growing scale and complexity of disasters/emergencies, it is expected that first responders are highly skilled and equipped with sufficient capability to meet the expectations of quick and effective response. Thus, there is a need to better assess capacity of existing disaster response capabilities and provide a more effective and coordinated response to any scale and type of disasters that may occur.

The aim of this research is to develop a capacity assessment framework to enhance disaster preparedness and response capabilities within Kingdom of Saudi Arabia. Key objectives include a critical examination of global best practice in disaster capacity assessment methodologies, identification and evaluation of existing approaches and key challenges in disaster response capacity assessment methods used within Saudi Arabia, systematic identification of Critical Success Factors (CSFs) for effective disaster response capacity assessment and development of assessment framework as a comprehensive measure for assessing disaster response capability in Saudi Context.

Research was split into four phases. In the review phase, a comprehensive review of state of the art within existing disaster capacity assessment approaches was undertaken. This was supported by data collected through focus groups and interviews. Within Needs Analysis phase, Critical Success Factors from global best practice review were identified. Also, comprehensive analysis of two disaster case studies was undertaken, supported by focus groups validation of key lessons learned. In the conceptualization phase of the research, multi criteria decision approaches were used to prioritize key factors with 21 experts. This was used as basis of developing a Disaster Response Capacity Assessment (DRCA) framework. DRCA framework developed as part of this research allows for evaluation of both qualitative and quantitative measures. Framework was validated using a three-pronged approach within Riyadh region including: a) Focus group to allow for self-assessment using DRCA framework. Collected responses were collated to provide an organizational wide picture of disaster

response readiness; b) Interviews with key staff were held. c) Review of key documentation as provided by participants.

Research results help establish that existing approaches used are not effective enough to mitigate the impacts of disaster nor is a formidable capacity assessment method being used. The conclusion is the development of a framework that can be used within Saudi context to assess capabilities for disaster response. Research has demonstrated a systematic approach to evaluate disaster response capacity.

DEDICATION

This work is dedicated to my family:

- My wife, for her understanding and support during the time spent away from home, without her, it would have been impossible to complete my work and thesis.
- My children - Faisal, Abdulaziz, Noura, Tariq, Fahad and Saad, for their continuous love, understanding and support.
- My Brothers - Saad, Abdulaziz and Fahad, who always encourage me in my PhD journey and helped me through the tough times.
- My sisters, whom I consider as mothers to me; Monaira and Sheikha. Thanks for inspiring me with your love and wisdom as well as teaching me that passion and commitment is the root of all success.

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LIST OF ACRONYMS

AHP	Analytical Hierarchical Process
CAR	Capability Assessment for Readiness
CDM	Civil Defence Management
CSF	Critical Success Factors
CRED	Centre for Research on Epidemiology Disaster
DRCA	Disaster Response Capacity Assessment
EMFs	Emergency Management Functions
FEMA	Federal Emergency Management Agencies
FAO	Food and Agriculture Organization
FEMA	Federal Emergency Management Agency
GDCD	General Directorate of Civil Defense
GSOEWS	Global Survey of Early Warning Systems
IFRC	International Federation of Red Cross
IPCC	Intergovernmental Panel on Climate Change
ISDR	International Strategy for Disaster Reduction
IDD	The international Disaster Database
IDNDR	International Decade for Natural Disaster Reduction
IFRC	International Federation of Red Cross
KPIs	Key Performance Indicators
KSA	King of Saudi Arabia
MOI	Ministry of Interior
MVC	Motor Vehicle Crashes
NCEMA	National Crisis and Emergency Management Authority
NCMS	National Centre for Meteorology and Seismology
N UNCAF	United Nations Capacity Assessment Frameworks
SMD	Saudi Meteorology Department
UNCAF	United Nations Capacity Assessment Frameworks
UNISDR	The United Nation's International Strategy for Disaster Reduction
UNESCO	United Nations Educational Scientific and Cultural Organization
UNPD	United Nations Procurement Divisions
UNISDR	United Nations International Strategy for Disaster Reduction
UN	United Nation
UNDG	United Nation Development

Chapter 1 - INTRODUCTION

1.1. CHAPTER INTRODUCTION

This chapter provides the background to the PhD research topic, whilst also establishing the context for the research. It discusses the research rationale, the need of the research and the aims and objectives of this research. As a result of growing urbanisation and rapidly changing geo-political situation, nature of extreme events, threats from various man-made and natural disasters in Kingdom of Saudi Arabia (KSA) is ever increasing, highlighting the need to effectively respond to natural and man-made disasters. However, recent evidence suggests that various levels of Government and emergency responders within KSA are insufficiently prepared to address the increasing demand for disaster response. Also, various public reports on response to natural and man-made disaster/emergency incidents also suggest that there is need to improve capacity to effectively respond to emergencies.

Contemporary literature, as discussed later in the thesis, abounds with problems of poor communication, lack of an integrated approach within disaster response efforts and absence of a consistent approach to determine readiness of efforts to encounter major disasters and emergencies, by police, fire brigade, civil defense and medical response efforts. Also, the growing scale and complexity of disasters/emergencies within highly engineered urban environments also highlight the need to develop disaster capacity assessment model from a national perspective, to ensure quick and effective response. This chapter is divided into nine main parts and explains the research problem and outlines key aims and objectives. It also explains key research questions, research objectives and choice of the research method. The chapter concludes with an overview of the thesis structure and content, as well as the chapter summary.

1.2. RESEARCH BACKGROUND AND RATIONALE

One of the most important challenges confronting our society is vulnerability of its urban areas to disasters (Mileti, 1999; Tierney et al., 2001; Godschalk, 2003). According to the Centre for Research on Epidemiology (CRED), there is an upward trend in number of natural and manmade disasters taking place worldwide (IFRC, 2012). Increasing population and highly

engineered nature of our built environments enhances the risk societies are exposed to, highlighting the need for better readiness to address vulnerabilities. Also, there are significant human and socio-economical costs associated with disasters, which further shows that building capacity for response has become a necessity in modern day world (Godschalk, 2003).

United Nations Disaster Risk Reduction defines capacity assessment as "the process by which the capacity of a group, society or organization is reviewed against desired goals, where existing capacities are identified for maintenance or strengthening and capacity gaps are identified for further action" (UNISDR, 2009a). In recent years, various national, regional governments, donor agencies and academics have made many contributions on establishing the disaster capacity assessment frameworks and methods. A study done by World Bank (2010) indicates that developed countries have superior capacity to prepare for, mitigate and respond to disasters with developing countries lagging behind. The study suggests that affluent countries, despite having valuable infrastructure, incur less damage and recover more quickly. One key feature of superior capacity is ability to constantly evaluate their capacity to deal with catastrophes or any level of disasters that can cause significant impact to normal operations.

KSA is no exception and is prone to the impact of various natural (e.g. earthquakes, hurricanes, floods) and manmade (e.g. terrorist attacks, fire, mass crowding) disasters. Figure 1.1 summaries different disasters types in Saudi Arabia including both the naturally occurring events such as earthquake and landslide, rains and floods, sand and storms, and the manmade disasters including mass gathering during Hajj seasons, Ramadan and other religious events.

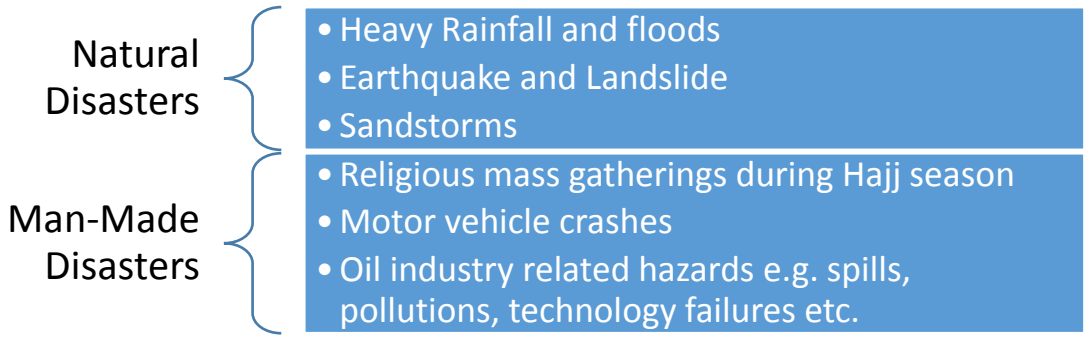

Figure 1-1: Major disaster types in KSA

Due to its geological location and contribution to the oil and gas sector, incidents such as oil industry accidents and related hazards e.g. spills, technical failures and heavy vehicles crashes, are also common manmade disasters which are considered as social impact disasters. Thus, the

economic and social impacts of these disasters on Saudi economy are huge, which indicate the need for increasing response capacity for dealing with disasters.

KSA has seen phenomenal economic growth in recent years. Consequent increase in urban population, increased settlements in high risk areas, technological risks, increasing built environments density (Mileti, 1999) and highly engineered environment and infrastructure (Prieto, 2002) have the further consequence in increasing human exposure to disasters. Son et al (2007) highlighted that modern cities are "complex and rely on inter-dependent systems including a mix of utilities, transportation, and telecommunication infrastructure, commercial and residential building". Disasters could seriously impact on a city's economic development, social stability and safety.

It is further argued that such network of systems within urban cities and interactions between components in metropolitan areas have consequent impact on such cities and people in the event of disasters. This is very true about cities within KSA, which have often seen growth in a haphazard manner without master urban plan and consideration of natural and man-made disasters. Limited understanding on how lack of urban planning contributes towards increasing vulnerability of major urban centres to disasters have seen KSA suffer when disasters occur. In KSA, almost 81% of the population resides in urban areas which have not been planned with disaster impacts in mind, thus indicating that quite a number of people are vulnerable to the impact of disasters in KSA (KSA Ministry of Economy and Planning, 2014). Schaafastal et al (2001) rightly argued that quality of disaster response and recovery efforts have a direct relationship with knowledge and skills of staff working at the disaster site and their ability to put various skills into practice in a range of hazard events. Thus, to ensure effective response, it is critical to have a consistent approach to monitor and evaluate various skills of disaster response operatives.

1.3. RESEARCH PROBLEM

Literature review indicates a growing number of studies (e.g. ISDR, 2002; Eleana & Bessis, 2010) showing an adverse impact of adequate disaster preparedness and response efforts on modern urban life. These studies indicate that secondary and indirect impact of disasters accumulated over the long term, make recovery prolonged in nature (Perrow, 2011).

Some of the factors found by ISDR (2002) study, have also been linked to level of vulnerability, exposure, risks, hazards and limited response capacity of communities or countries, prone to impacts of disasters.

There is a great deal of variation in the way disaster and emergency management capacity is built across various countries. Review of disaster response practices within developed countries such as United Kingdom, Canada, USA and New Zealand indicate a grass roots bottom up approach to disaster capacity development (e.g. FEMA, 2008; MCDEM, 2010, JIBC, 2016). In such bottom up approach, local governments play a key role in disaster mitigation and response (FEMA, 2008). Key responsibility for managing response effort in such an approach is in hands of local officials (Waugh and Streib, 2006).

In sharp context, within Kingdom of Saudi Arabia (KSA), a top down approach to disaster response is prevalent, where the Ministry of Interior (MOI) has the ultimate responsibility of handling disasters, protecting lives, property and ensuring security. Review of recent disaster response efforts (e.g. Momani et al., 2010) have highlighted the limitations of existing approaches to effectively deal with disaster response and recovery activities. Therefore, in order to reduce impact of disasters, it is important to develop a model for assessing readiness of existing efforts as well as the relationship between the levels of readiness in ensuring effective response (Alexander, 2005). Problems like this and lack of clarity about the response capacity of the MOI and all regional organisations responsible for response makes this research necessary. In addition to this, the following subsections briefly explain the research problems that justify the need for and relevance of this research.

1.3.1. Need for Disaster Capacity Assessment

Within KSA, General Directorate of Civil Defence (GDCD), which is an integral part of Ministry of Interior (MOI), is the official body responsible for emergency and disaster management (GDCD, 2014). Almari (2008) identified that emergency management within KSA is still struggling to proactively manage current risks and vulnerabilities, let alone preparing for potential future disasters. Review of recent disaster response efforts indicates limitations of GDCD in dealing with major disasters, especially the ones that involve large crowd. Whilst massive investments as a result of growing economy has resulted in

development of a highly engineered urban infrastructure, corresponding improvements within procedural and disaster response capabilities have not taken place.

Thus, it is argued that to enhance disaster preparedness and response capabilities, it is important to assess capacity of Saudi Civil Defence organisations in KSA. A structured capacity assessment framework would provide a central and defined approach and motivation for national civil defence to enhance existing capabilities and by identifying critical gaps to be filled. According to Alexander (2005), such central and defined model or approach is also key in identifying the limit of emergency organisations and in determining where external support is needed and from whom. Therefore, the lack of central or well-defined capacity assessment model emphasise the importance of a research such as this, so that a consistent approach is developed in monitoring and evaluation of capacity for disaster response and to develop innovative ways of dealing with disasters of any size.

1.3.2. Minimising Severe Impacts of Disasters in KSA

Review of relevant literature in the area of capacity assessment for disaster response indicate that much of the published literature is done by major donor organisations and international agencies such as UN, emphasising the need for developed countries to focus more on capacity building for disasters. Beyond this, capacity development and assessment projects are recommended to be based on a thorough understanding of the situation within the concerned country (UNDG, 2007). Within KSA, Interior of Ministry is responsible for disaster related administrative arrangements. While it is understood that effective policy and implementation could lead to better disaster preparedness and response, there is yet to be model for determining the adequacy of response arrangement for disasters. However, review of response efforts to recent disasters raise questions about efficacy and effectiveness of existing arrangements in KSA.

Although many believe it is the responsibility of DGCD to ensure that there is effective governance to formulate policies and build capacities to deal with major disasters, this is yet to translate into practice. The nature and types of disasters within KSA in recent years have been quite distinct, which emphasise the need for developing a national capacity assessment framework, suited to local needs and requirements. For instance, many disasters and emergencies have taken place during massive congestion during Ramadan and Hajj seasons,

which are of particular significance in Islamic calendar. During the peak season, over 4 million people could be in attendance in geographically confined spaces. This puts enormous strain on civil defence resources and the continued occurrence of the catastrophic disasters and accidents that continue to occur during this period shows the need to improve capacity assessment. Table 1-2 shows the pattern and continued occurrence of crowd control related emergencies, occurring during Hajj season. Specific nature of such accidents highlight the need for an in-depth investigation to determine nature of the problem and devise appropriate strategies.

Table 1-1: Hajj-related incidents (adapted from The Guardian, 2015)

Type of disaster	**Date**	**No. affected**	**No. killed**
Fire during Hajj	December 1975	NDA	200
Militant occupation of Holy Mosque in Makkah	November 1979	560	153
Iranian riots during Hajj	July 1987	NDA	675
Stampede inside pedestrian tunnel during Hajj	July 1990	NDA	1,426
Fire during Hajj	April 1997	More than 1,500	343
Stampeded in Mina	April 1998	180	118
Stampede at Mina	March 2001	NDA	35
A crush of pilgrims at Mina	February 2004	Hundreds	250
Stampede in Mina	January 2006	NDA	360
Eight-storey building collapsed	January 2006	NDA	73
Crane collapses in bad weather	11 September, 2015	400	107

Stampede in Mina	24 September 2015	Hundreds	310

Table 1.1 shows that not huge gathering of pilgrimages during Hajj season within a confined area increases exposure to various types of accidents, making the situation more complex to manage. It can also be noticed that, such a mass gathering of people, from all over the world, increase the potential of various hazards and puts enormous stress on local resources. For instance, stampede in 1990 lead to 1,426 deaths while, that in 1994 (which is not included in Table 1.1) lead to 270 deaths. Stampede in 2015 resulted in loss of well over 2000 lives (Mina Stampede, 2015). Also, a major crane accident killed over 100 people and injured around 280 people in September 2015 (Batrawy, 2015).

During peak periods, emergency planners and responders have to operate on full capacity and surge capacity of human and physical resources is almost null (Alamri, 2008). This increases the potential impact of disasters and the continued increase of vulnerability to disaster impacts. In addition to this, the impacts of these disasters show that assistance in terms of response are often required form other places only when the disaster might have unfolded. This shows lack of adequate planning and response capacity assessment to determine the required capacity for responding to different levels, scales, and nature of disasters.

1.3.3. Changing role of Emergency Responders and Challenges

In recent years, the role of emergency responders has rapidly evolved. Previously, emergency responders were limited to perform civil defence activities and their role was primarily reactive. However, in recent years there is gradual push towards more proactive and preventative role for emergency responders (Alexander, 2005). Britton (2001: pg 45) discussed that previously emergency managers used to perform under strict command and control civil defence type approach. However, this role is subject to on-going transformation, which is influenced on need, requirement and potential impacts of disasters (Perrow, 2011).

McEntire (2007: p.169) defined role of emergency managers as "*public servants who employ knowledge, techniques, strategies, tools, organizational networks, and successfully deal with their impacts in order to protect people, property, and the environment*" (p. 169). Literature

review reveals that there is lack of clarity on what emergency managers do or what their job role is, resulting in other disciplines continuing to have influence over them, affecting their credibility and visibility (McEntire, 2007). Figure 1-2 highlights emergency management cycle, which also shows how limitation of capacity can influence other areas.

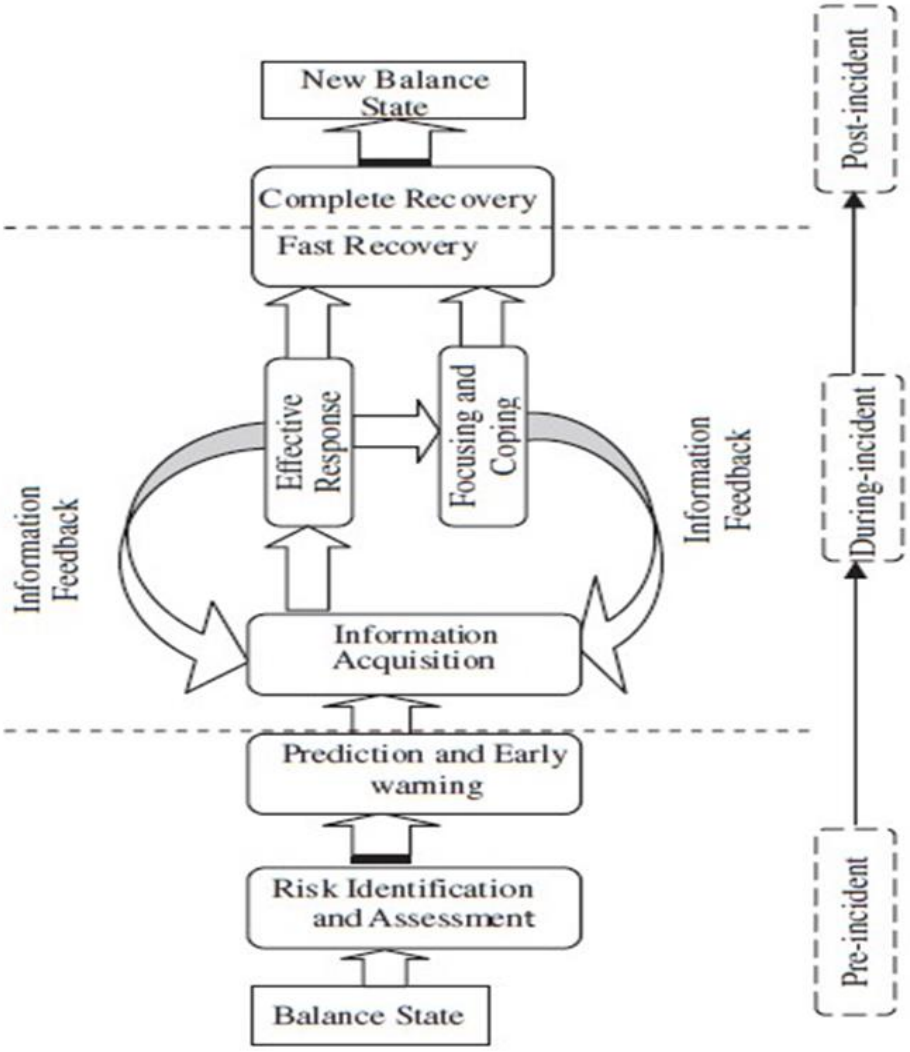

Figure 1-2: Emergency Management Cycle (Chen, 2012)

Figure 1.2 presents three phases of the emergency management cycle; the pre-incident phase with its three stages, then the operation during the emergency, and finally the post incident phase. Taking these stages into consideration, Chen (2012) explained that the pre-incident stage represents three stages these are; the balance state that leads to identification of the risk and its

assessment that is before predicting the early warning state. Then during the incident; which is mainly for information acquisition and feedback regarding the operation of effective response and focusing and coping with the situation for fast recovery followed by a complete recovery for establishing a balance state in the post-incident stage. Selves (1997) highlighted the challenges faced by emergency managers as, since emergency management is the process that often makes public officials think, decide and plan for uncertain situation, unpredictable and the unforeseen events.

1.3.4 Limited training and awareness among emergency responders

In KSA, emergency responders come from a diverse background without any formal qualification requirement. Without any defined structure for professional development, emergency responders often struggle to meet complex challenges posed by modern day disasters. Given rapid urban and socio-economic development in KSA, emergency responders are expected to play a key role in enhancing resilience and play a proactive role to educate masses. Emerging gap between role expectation and existing situation highlights the need to undertake further research to ensure they are prepared to meet new requirements and challenges. Figure 1.3 highlights the gap between existing lack of professionalism and growing demands of complexity on emergency response. This research tries to better understand key challenges in existing training of first responders and focuses on developing a training framework suited to meet challenges posed by disasters and emergencies in urban centres within KSA.

Figure 1-3: Limitations of existing training of first responders (adapted from Alamri 2008)

The limiting factors of the existing training of the first responders and their complexity are evident in Figure 1.3. These factors mainly revolve on lack of the necessary certification

programs, and lack of skill development programs and the lack of the qualification required for the entry. The complexities of these are reflected on the emergency response multi-disciplinary field, and the lack of inter-agency co-ordination that is necessary for the effective operations, the structure of the command control.

Personnel in the Ministry of Interior are recruited from various other departments and have a wide range of educational and training background not particularly related to emergency or disaster management. Recent disaster response efforts identified key gaps in training of disaster responders. Due to this diverse background, disaster risk planning, capacity assessment and other issues related to core emergency and disaster management is always not prioritised due to limited awareness about their impact when they occur. Since impacts of recent disaster response efforts in KSA also reveals key gaps in capacity and delivery at both national and local levels. It is against backdrop that need for a capacity assessment framework to better assess disaster preparedness and response capabilities become apparent. Implementation of a capacity assessment framework can support better understanding of the implications of not having one. It is also important in order to reduce the current level of vulnerability to disasters and in identifying key gaps and the use of model which will provide indicators against which success can be measured.

1.3.5 Lack of documentation and existing data in capacity assessment

A review of recent disaster response efforts in KSA has highlighted various shortcomings. Unlike many developed countries, there is lack of published literature available in Saudi context. As identified by Alamri (2008), KSA is still struggling to proactively manage current risks and vulnerabilities, let alone prepare for potential future disasters. The implications of all the research problems highlighted in this section leads to lack of documentation of information on the same. In many developed countries, the literature review indicates that in recent years, various academics working in parallel with national and local governments have developed various disaster capacity assessment methods and systems.

Japan is one of the countries that that practice such collaborative, parallel and multilevel disaster capacity assessment development (Hayashi, 2004). Japanese system spreads responsibility through directive approach that includes central government where the central government handles mitigation and parts of recovery (Greer, 2012). While central government manages this, prefectures (regional) and local governments sort out other areas of capability assessment and development system (Greer, 2012). Such a multilevel and collaborative

capacity assessment is lacking in KSA which further emphasises the importance of this research. Therefore, some of the existing assessment models, methods and systems from other countries with best practice are critically examined in chapter two of this thesis.

While this lack of empirical literatures, documentation of issues on emergency management and response capacity in KSA are evident in this research, it also exposes the lack of communication that exists in the system. For instance, during mass gathering of pilgrimages during Hajj and Ramadan, many lives were lost because of lack of effectiveness of response efforts (Alamri, 2008). However, there is little or no literature which document this outcome, reasons or causes for such lack of effectiveness and the possible way forward for improving the system. A number of factors have been identified by emergency professionals and first responders to have contributed to lack of effectiveness of disaster response efforts in KSA. These include, but not limited to:

- Increasingly sophisticated nature of man-made disasters such as terrorist attacks and lack of input of international expertise required to tackle the threat (Maben et. al, 2010).
- Social and demographic issues such as high rate of illiteracy resulting in people not being able to read or follow instruction such as safety brochure and emergency leaflets;
- Communication problems including language barriers. KSA has a huge expatriate population who do not speak Arabic.

However, none of these factors have been subjected to rigorous research or investigation process to determine the most prevalent causes and factors for continued high impact of disasters in KSA. All above mentioned factors, highlight the need to enhance disaster resilience and readiness. A study published by Momani et al (2010) investigated the response efforts to flood disaster in Jeddah city in the year 2009 indicated otherwise. The investigation by Momani et al (2010) highlighted lack of emergency management plans and bodies as fundamental or prevalent factors as responsible for the ineffectiveness of response. The authors found that there were no early warning systems in place to inform the population in a timely manner and no documented plan that people could refer to. The infrequent nature of various disasters creates additional problems in ensuring disaster readiness. Very often disaster preparedness is on anticipated demand and not on basis of empirical data (Maben et. al, 2010).

Also, lack of usage of modern technology resulted in delays in detecting missing people which further made the impact of the disaster more severe. Issues like this shows that governmental

bureaucracy in acquiring equipment can further slowdown the possibility of effective disaster response. However, such assumptions are yet to be investigated in such a way to link governmental bureaucracy in KSA to lack of response capacity assessment. Thus, all these problems and possibly more which will be identified in the course of this research testify to the need for and importance of this research topic. It is on this rationale and research problems are the following set of objectives, research questions and aim have been developed.

1.4 RESEARCH AIM AND OBJECTIVES

The aim of this research is to develop a capacity assessment framework to enhance disaster preparedness and response capabilities within Kingdom of Saudi Arabia. This aim emphasizes the need for consolidated objectives which are outlined below. The research has the following objectives:

1) To critically examine global best practice in capacity assessment and methodologies for disaster management.
2) To identify and evaluate existing capacity assessment methods and approaches used for disaster preparedness and response in Saudi Arabia
3) To analyse the impacts of challenges and identification of Critical Success Factors in capacity assessment of disaster response readiness
4) To develop framework for assessing disaster preparedness and response capability in Saudi Arabia
5) To validate and assess the disaster preparedness and response capacity assessment framework
6) To develop recommendations that can guide and influence the development of monitoring and evaluation culture amongst Saudi national government, local Civil Defence organisations and the Saudi ministry of Interior.

From these objectives, the following research questions are derived so that the focus of the objectives can be retained and used as guide for the entire research investigation process.

i. What are the global best practices for capacity assessment and monitoring and evaluation of disaster response preparedness?

ii. What assessment approaches/methods are currently in use within Saudi Arabia for determining disaster response capacity?

iii. How effective are the existing frameworks and methods for disaster response?

iv. What are the critical success factors required in KSA in order to enhance disaster preparedness and response capacity?

v. How can disaster preparedness and response capacity be enhanced using capacity assessment framework in order to improve disaster resilience?

The ability to use the research objectives and questions as guide for developing content of each chapter is key to conducting an objective, valid and reliable research. The process for doing this as effectively as possible is further explained and discussed in the next section.

1.5 OUTLINE RESEARCH METHOD

Fellows and Liu (2008) highlighted that choice of research methods is dependent on type and nature of research problem being solved. This means that research process entails key phases or stages that must be followed before the research can be conducted thoroughly and set out objectives achieved. Key stages of the research process are outlined in Figure 1.4 and explained in more detail in Chapter 3.

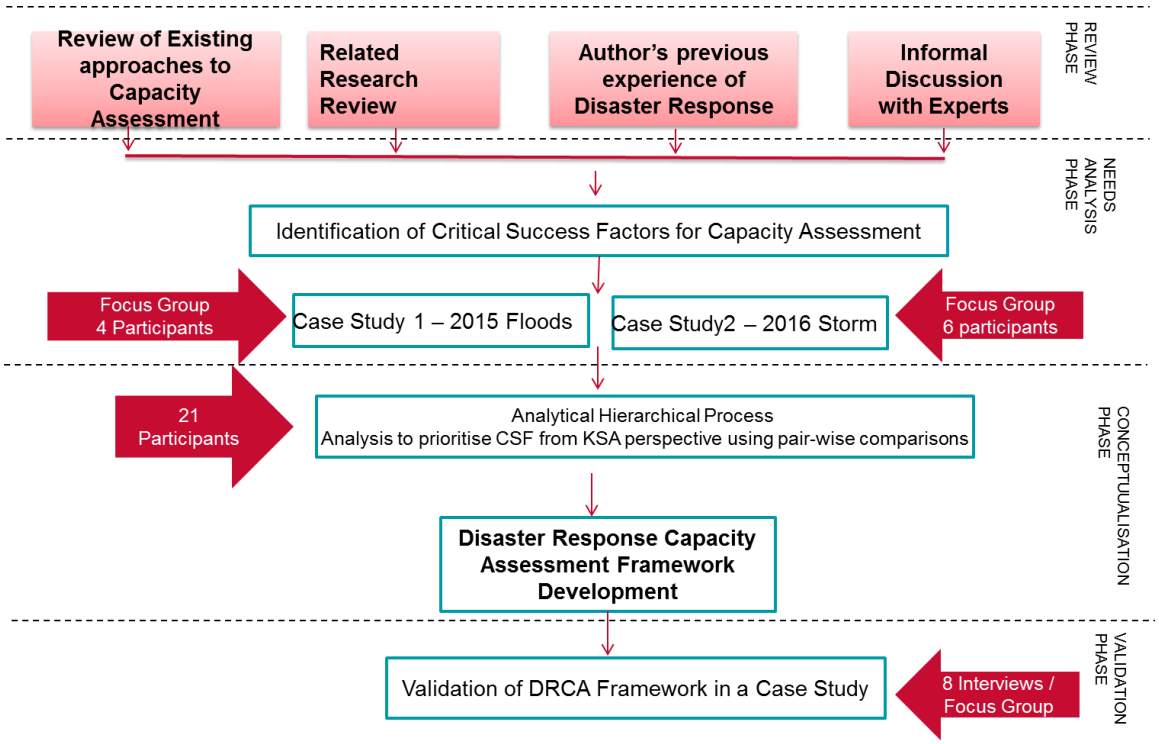

Figure 1-4: Key stages of Research process

Fellows and Liu (2003) highlighted that research methodology encompasses principles and procedures of logical thinking process applied to solve a research problem (Fellows and Liu, 2003). Figure 1.4 indicate logical progression of research from the review phase, the needs analysis, the conceptualisation and validation phase. All these phases interact in a way that every element of the research contribute to abovementioned research objectives. For instance, in the "Review Phase" of research, key focus has been in identification of existing knowledge gap within KSA context and to develop an understanding of theoretical and practical approaches to disaster preparedness and response capacity assessment approaches. A comprehensive investigation of contemporary literature, with a view to capture and identify the knowledge gap was undertaken.

Wider review included coverage of literature in the area of enhancing disaster resilience, disaster response capabilities and disaster related capacity assessment within KSA context. To look for relevant articles, author relied on major academic databases including Web of Science, Science Direct and Emerald. Review phase also focused on being able to develop a good understanding of existing practice within Ministry of Interior (MOI), KSA. In the "Needs Analysis" phase, approaches such as case study analaysis, focus groups and expert interviews were used, to develop a critical understanding of need of capacity assessment in Saudi context and identification of critical success factors for ensuring that adequate level of response capacity is achieved. Based on the input from previous two stages, in the conceptualisation phase, a "Disaster Management Capacity Assessment" framework is developed, which is validated in the subsequent phase.

The needs analysis phase involves the combined use of methods which provides justification for the use of mixed method gained from best aspects of quantitative and qualitative research. Quantitative methods become necessary in order to better understand existing training needs of emergency responders in KSA. Based on findings from quantitative data, qualitative methods are used to explore key aspects of data derived from quantitative methods. Through the mixed method strategy, the purpose for conducting this research becomes clearer as well as the choice of methods. The validity and reliability of data collected for the needs analysis phase are increased by combining quantitative and qualitative methods. The validation process also encourages a process called 'triangulation' which means the use of more than two methods of data collection to ensure that results are more accurate and objective.

Thus, the theoretical and conceptualisation of data that concerns disaster capacity assessment are developed from the outcome of using mixed methods. Epistemology, research approach, data collection strategies and analysis tool also help to enhance data validity. It is also important for the axiological and ontological underpinning of this research area to be established, which became clarified during the review and needs analysis phase. Therefore, all these phases interact to help identify and determine the most suitable methods for conducting this research. However, the research onion by Saunders et al. (2016) became useful as reliable progressive guide for selecting the specific tools and strategies more suitable for carrying out a research of this nature.

1.6 RESEARCH SCOPE

The research scope is influenced by the research objectives and the research problem which research aims to solve. Other key constraints in determination of research scope included researcher's resources and timescale. As explained in the last section, the phases established for this research demonstrates the scope and boundaries of this research to identify and investigate issues that contribute to enhanced disaster response capacity and the contribution of capacity assessment in improving the same. Thus, in terms of scope, the literature, legislative and materials consulted are based on emergency and disaster management theory and practice. It also means that participants recruited for this research are also practitioners, experienced people and academics in the field of disaster and emergency management in KSA.

However, the case studies, examples and references used in this research have focus on KSA, but draws general information from across the world, especially areas where emergency and disaster management is well advanced. The organisation considered as paramount for this research are first response organisations and personnel, Ministry of Interior, KSA, General Director of Civil Defence (GDCD) and any organisation involved in responding to emergencies and disasters in KSA. This focus is to ensure that quality, valid and relevant data are collected and information derived from the primary data are relevant and useful for developing an effective capacity assessment model and framework for KSA.

The need for an effective management and capacity assessment model become important as an organisation enlarges in its size, and its functions become complex (Bamford and Forrester, 2003), and performance and management practices are linked to each other (Mitzberg, 2003). The scope of this study is to examine existing approaches towards disaster capacity assessment

within KSA and to develop an effective capacity assessment model suited to local needs in KSA. Within this scope, the terms "emergency response" and "disaster response" are used interchangeably as skill set required in both cases are similar. Also, this study has the scope of focusing on disasters and crisis preparedness and response and identifying the need for training, training policy and programs development, and establishing national focus on disaster and crisis management programs.

1.7 RESEARCH CONTRIBUTION AND SIGNIFICANCE

This research aims to develop capacity assessment model which can be used in KSA for reducing the impacts of disaster and ensuring that response is more effective when conducted. This aim indicates the contribution of this research and how the research seek to provide better understanding for what is required in disaster or emergency response. Thereby, showing that this research has the potential to contribute to academic field of emergency and disaster management. In an attempt to ensure this academic contribution is possible and advance in future through other researches this topic would have inspired, this research has the scope that will also contribute to practice in KSA. Beyond the direct contribution of this research to advancing disaster and emergency response in KSA, the research also has potential of contributing to disaster and emergency management in any country with similar challenges or problems as the KSA.

Therefore, the motivation behind this research study was driven primarily by personal interests due to author's direct involvement in various disaster response operations working as an official for Interior of Ministry, KSA. Also, author has direct involvement in training of the professional personnel to deal with disasters and crisis in Saudi Arabia. Access to historical data is easy due to the author working within interior of ministry. Similarly, the data will remain within the ministry, hence it will not be compromised. A key perceived challenge is lack of professionalism and need to provide a structured framework to enhance existing professional development. This will enable the country to better prepare for emergencies and disasters. The significance of the research is due to the fact that Saudi Arabia has been subjected to many natural and security disasters during the past 10 years. Therefore, the need of effective capacity assessment become necessary to deal with such disasters and crisis.

1.8 STRUCTURE AND CONTENT OF THESIS

This thesis is written in a systematic manner to show the research investigation process. The content and structure is to ensure that the research remains within the set scope outlined for conducting this research and ensuring that the research is do-able. The following outline forms the structure of this research as it progresses into different chapters.

Chapter 1 – introduction to the chosen subject matter which provides background and discusses the research problem. The research aim, questions and objectives have been discussed and the scope of the research have been established. The research framework is also explained and how it aims to help generate results with potential to contribute to the academic and practice field of emergency and disaster management.

Chapter 2 - Review of the current literature published on the subject matter, from resources such as books, journals, reports, and research data. The gaps in research area identified while the research context and concept are critically examined, evaluated and analyzed. This critical process justified the chosen subject matter and the reasons for conducting this research.

Chapter 3 – The research methodology is discussed and the rationale behind the selection of qualitative research data collection and quantitative research for this subject area is justified.

Chapter 4 – Examining case studies of disaster scenarios in Saudi Arabia, this chapter puts the rationale for capability assessment into context. It uses case studies, which is one of the data collection techniques examined in chapter 3 to identify gaps which the literature review did not identify and specific areas which need to be further investigated during the fieldwork.

Chapter 5 - The chapter presents and discusses results obtained from primary and secondary data. This chapter also reviewed and analysed, and ensured that comparisons are made between the data collected in relation to epistemology that determines the context of the research area.

Chapter 6 – this chapter relates the subject matter; research aim and objectives to the results presented and discussed in chapter 5. The latter part of this research also presents, assesses and validated the framework that is proposed for improving disaster and emergency response arrangement for dealing with different emergencies and disasters in Saudi Arabia.

Chapter 7- Conclusion and recommendation, presents the study findings for each objective and outlines the recommendations that emerged from the study. Recommendations, research limitations and areas of further research are other sections included in this chapter.

1.9 CHAPTER SUMMARY

This chapter has provided a background to the research as well as overview of the location of study. It has also justified the reasons for undertaking this study and outlined the aim, objectives and research questions. All of which have provided information about the specific focus of this research and information about other chapters in this thesis. Other sections explained the scope and limitations of this research and how they are managed, this section also briefly discussed the research methodology. Although this research has also raised the question of whether it is possible to effectively utilise the lessons of past disasters for preparing for future disasters, a review of existing literatures is important to provide explanations for the research area. Therefore, the next chapter is devoted to extended literature review on existing texts and articles written on this subject and related areas to this research scope.

Chapter 2 -LITERATURE REVIEW

2.1 CHAPTER INTRODUCTION

This chapter presents a literature review to critically appraise the current knowledge and the direction in the area of disaster and emergency capacity assessment. The chapter includes both descriptive (describing work of previous authors) and analytical (critically analysing work of other authors) analysis and it identifies similarities and contradictions in the published material (Naoum, 2013). The Chapter starts by reviewing key disaster related concepts underlying this thesis. Sections that follow this identify and evaluate capacity assessment methods and approaches used in different countries, to allow for a comparative analysis of approaches uses in disaster capacity assessment. The existing approaches to capacity assessment within Saudi Arabia are discussed and evaluated against the best practice identified in other countries. The following section assesses the challenges which hinder response capacity in Saudi Arabia and critical success factors required to enhance disaster response are discussed. This chapter concludes with a summary of gaps identified in literature review and existing capacity assessment methods, while emphasizing the significance of this chapter to the entire research inquiry process.

2.2 REVIEW OF KEY CONCEPTS USED IN RESEARCH

Disaster is a term loosely used to describe a distressing situation, including both individual and communal. The situations may include fires, drowning, earthquake and tornado, epidemics and starvation, heat and cold, rats and *locusts* (Kumar, 2000). United Nations (UNISDR 2004) define disaster as, "a series disruption of functioning of society, causing widespread human, material, or environmental losses which exceeds the ability of the affected society to cope using only its own resources". However, disaster is also defined as an event concentrated in time and space, in which a community experience severe danger and disruption of its essential functions, accompanied by widespread human, material or environmental loses, which often exceed the ability of the community to cope without external assistance (Smith, 2013). While the latter definition seems similar to the former, the definition by Smith (2013) emphasized the concentration of the event in time and space, suggesting that these characteristics is what makes disaster distressing and overwhelming for affected community.

Another terminology often used in literature to explain disruption is the word ‘emergency’. According to Alexander (2002), emergency is as an event which arises internally or from external sources and it may adversely affect the safety of people in a place and requires immediate response of emergency organisations. Alexander (2002) also added that an emergency can be thought of in direct and indirect terms, and that the impact associated with a disaster can last for many years. This does have ramification for planning, response and recovery from the impact of any disruptive event, either a disaster which exceeds the capacity of affected community to deal with, or an emergency which disrupts livelihood and causes significant damage, requiring coordinated response of several emergency organisations (Dillon et al. 2009).

In this regard, effective disaster or emergency management is a key element in good governance (UN/ISDR, 2002). Emergency or disaster management involves facilitating activities that pertains to plans, structures, and arrangements established to engage the normal endeavours of governments, voluntary, private agencies and even community at risk in a comprehensive and coordinated way to respond to a whole spectrum of emergency needs (Smith, 2013; Alexander, 2005). However, managing, facilitating and coordinating all activities and stakeholders for disaster or emergency management can be challenging (Smith, 2013).

Thus, an understanding of context and scope of emergency and disaster management is important (Haddow et al. 2008). Although Smith (2013) argued that this understanding needs to be based on knowledge that the activities undertaken during one phase of disaster management affects activities under another phase. According to McCreight (2011), Haddow et al. (2008) and Dillion et al. (2009), disaster or emergency management can be coordinated and understood as a cycle or a process that involves certain phases. Although views differ on the number of phases for emergency or disaster management in the academic field, there is a common perception in practice that there are four phases that emergency managers should focus on. These phases are mitigation, preparedness, response and recovery. The relationship and influence of activities in each phase is illustrated in the diagram (Figure 2.1) below.

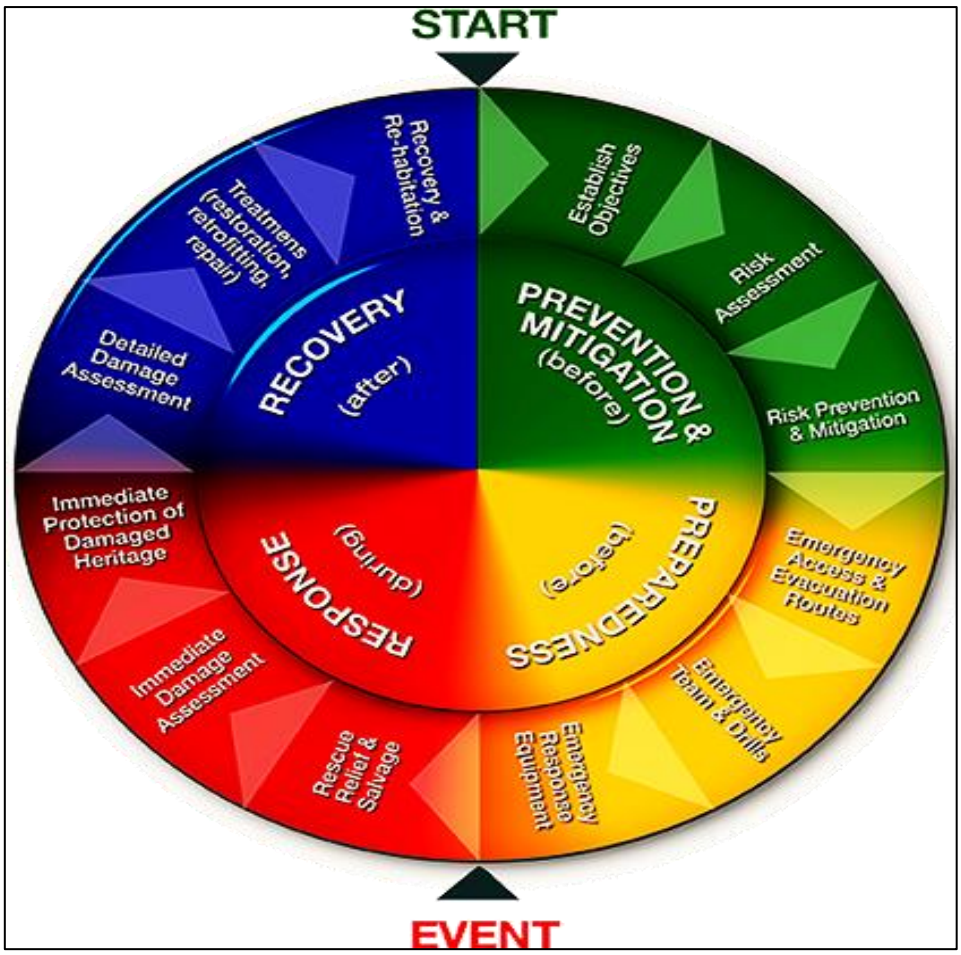

Figure 2-1: Disaster Management continuum (Fire & Risk 2016)

The red part within Figure 2.1 refers to response phase, suggesting the critical stage when the occurrence of a disaster can cause severe consequence, in case if capacity for response is insufficient. Although different terms are used to explain each phase, the activities and actions taken in each phase are consistent with ensuring reduction or prevention of consequences. Subsequent sub-sections in this chapter focus on evaluating the importance and relationship between each phase and factors, that can influence activities and actions in each phase.

2.2.1 Risk Reduction/Mitigation Phase

At this stage community, have either returned to the pre-disaster living, or still carrying on the recovery phase in an attempt to reduce the impact of subsequent disasters (McCreight 2011). Irrespective of the condition of living of the affected community, there is a recognition of the need for certain measures to be put in place to reduce the impact of the next similar disaster or unforeseen disasters (Coppola, 2011). Mitigation measures are grouped into two primary categories: structural and non-structural (Alexander, 2002). Structural mitigation measures are

those that involve or dictate the necessity for some form of construction, engineering, or other mechanical change or improvements, aimed at reducing hazard risk likelihood or consequence (Preston, 2012). Structural measures are generally expensive and include a full range of regulation, compliance, enforcement, inspection, maintenance, and renewal issues (Alexander, 2002). Non- structural mitigation, generally involves a reduction in the likelihood or consequence of risk through modification in human behaviour or natural processes, without requiring the use of engineered structures (McCreight, 2011). However, Coppola (2011) argued that any mitigation measure ought to be aimed at ensuring adequate preparation and planning for inevitable disaster events.

2.2.2 Preparedness phase

Preparedness phase involves development of awareness plans and training among all stakeholders in the community (Haddow et al 2008). This phase also ensures that the mitigating measures initiated during the risk reduction/mitigating phase are translated in logistical arrangements, which can help to successfully save lives while ensuring continuity of operations and business (Dillon et al. 2009). Waugh (2000) also described this phase as the "all-hazard" planning, training and public information stage. He further reinforced the mission of this phase as one which informs state-wide agency on coordination of disaster, hence it is considered as the stage in which capacity for disaster response is developed (Waugh 2000).

2.2.3 Response Phase

Response phase involves the immediate reaction to the occurrence of disaster (McLoughlin 1985). This stage is often characterised by confusion resulting from uncoordinated reaction to the occurrence of disasters (Pelling 2003). Despite this confusion, this stage has been observed to possess the capability to reduce the impact of disasters in the affected community, if and when response action(s) between all involved are operationally, tactically and strategically coordinated (Dillon et al. 2009). Disaster response is critical for every organization (Kostman, 2004; Van Krik, 2004) and includes functions of emergency management actions aimed at limiting injuries, loss of life, and damage to property and the environment are taken before, during and immediately after a hazard event (Coppola, 2011).

Response is a process that begins as soon as the hazard event is imminent and lasts until the emergency is declared over. The response to a disaster begins as soon as the imminence of a hazard event is recognized by officials with the authority to commence the response effort.

Once disaster response begins, the first priority is saving lives. This activity, which includes search and rescue, first aid, and evacuation, may continue for days or weeks, depending upon the disaster's type and severity (Coppola, 2011).

Decisions made during emergencies can be improved by using knowledge from past events to generate current and future response procedures (Turoff, 2002). Analysis of the past emergency events for lesson learned and understanding of what may work best in given situations enables emergency managers to prepare planned responses as a counter to the stress of emergency. Decision tasks are perceived to be difficult by the emergency managers where issues involving lifesaving operations such as evacuation or triage have the potential to have devastating results if not conducted accurately (Danielson & Ohlsson, 1999).

2.2.4 Recovery/Rehabilitation Phase

This is the immediate phase in which the needs of the public are met in relation to the level of impact caused by the disaster. Recovery may vary for victims and affected communities, because this stage is determined by the assessment of the disaster (Preston 2012). Recovery can be divided into two distinct phases, each with very different activities: short-term and long-term (Coppola, 2011). The short-term recovery phase immediately follows the hazard event, beginning while emergency response operations are ongoing (Haddow et al. 2008). Short-term activities seek to stabilize the lives of the affected people in order to prepare them for the long road toward rebuilding their lives.

Long-term recovery on the other hand does not begin in the earnest until after the emergency phase of the disaster has ended (Preston, 2012). In long- term recovery the community or country begins to rebuild and rehabilitate. The long-lasting period of recovery, follow major disasters require a tremendous supply of resources. Concept such as risk and hazard are major factors that influence the effectiveness of measures, activities and actions taken in all the phases leading to the recovery (Pelling 2003). Exposure to risk and hazard can increase the impacts of disaster events and the ability of affected community to recover promptly (Pelling, 2003).

2.2.5 Risk

Risk can be considered as the likelihood of occurrence of an event multiplied by its consequences, in case it occurs (Ansell & Wharton, 1992). This definition is further expressed as:

"*Risk = Likelihood x Consequence*"

In this equation, likelihood can also be interpreted as the probability of frequency, and consequence is considered as a measure of effect of the hazard on properties or people (Jacob, 2009). However, any factor that may increase the likelihood or a consequence of a hazard can increase the risk (Alexander, 2006). Thus, undertaking a thorough risk assessment and management is important and required for effective mitigation, preparedness, response and recovery phases of disaster management (Alexander, 2005). Risk analysis is about establishing a standard and therefore comparable measurements of the likelihood and consequence of every identified hazard (Jacob, 2009). Which means that when considering the mitigation options suitable for treating a hazard risk, several general goals classify the outcome that disaster managers may seek as: risk likelihood reduction, risk consequences reduction, risk avoidance, risk acceptance, and risk transfer, sharing, or spreading (Jacob, 2009; Pelling, 2003; Smith and Fischbacher, 2009). All these are all important for decision making for risk management as well as determining measures for mitigation, preparedness and response (Canton, 2007).

The consequence component of risk describes the effects of risk on humans, built structure, and the environment which is why developing sufficient capacity for response is essential (Canton, 2007). In the event that response capacity is insufficient, consequence have been observed to be severe (Coppola, 2011). Consequence are often determined using three criteria; deaths/fatalities (human), injuries (human) and damages in cost reported in currency (Coppola, 2011; Canton, 2007). Thus, risk evaluation is conducted to determine the relative seriousness of hazard risks for the country or community being assessed by the disaster manager, in order to prevent or reduce the consequence of risks. However, in order to adequately evaluate risk, the knowledge of hazard is important (Smith and Fischbacher, 2009).

2.2.6 Hazard

Hazard is defined as events or physical conditions which may cause potential injuries, fatalities, or damage to infrastructure, properties, and damage to environment or interruption of the business or any other losses or harm (FEMA, 1997). However, risk and vulnerability can turn the hazard into disaster. The first step in an effective disaster management efforts are the identification and profiling of the hazards. To do hazard profiling, it is important that a base map be obtained or created. A base map contains important geographical, political, population

and other information upon which hazard information may be overlaid (FEMA, 1998). The impact of hazard is severe when the community at risk is exposure to hazard or vulnerable in certain aspects (Smith, 2013). Vulnerability in this sense means the measure of the propensity of an object, area, individual, group, community, country, or other entity to incur the consequence of a hazard (Pelling, 2003).

According to Alexander, (2006), the measure of consequence a community at risk suffers often results from a combination of physical, social, economic and environmental factors or processes. Thus, actions that can lower the propensity to incur harm decrease the vulnerability (Pelling, 2003). However, capacity needs to be developed in view of responding to hazards and risk which cannot be prevented or when vulnerability of a community at risk cannot be completely reduced (Coppola, 2011). This need emphasise the importance of this research which focuses on capacity assessment for response to disasters, since it is essential to assess capacity for response in order to ensure that measures, strategies and activities in place for response are sufficient for reducing the consequence of any hazard (Canton, 2007; Alexander, 2005).

2.3 REVIEW OF CAPACITY ASSESSMENT METHODOLOGIES

Capacity assessment as explained in chapter one is a process where capacity of a group is reviewed against desired goals (UNISDR, 2009a). Further to this, UNISDR (2009a) emphasised that capacity assessment is essential where existing capacities are identified for strengthening especially where capacity gaps require actions. In recent years, various national, regional governments, donor agencies and academics have made many contributions to establishing the disaster capacity assessment frameworks and methods. As identified by World Bank (2010), there are indications that developed countries have advanced in their efforts to build capacity to prepare for, mitigate impacts of and respond to disasters. This is perhaps due to the established frameworks, approaches and ability to constantly evaluate level capacity to deal with catastrophes (World Bank, 2010; Smith and Fischbacher, 2009). Some of the existing capacity assessment approaches are reviewed below:

2.3.1 United Nations Capacity Assessment Frameworks (UNCAF)

UNCAF is based on Harvard Institute for International Development framework for capacity assessment and development. Overall goal of UNCAF is to "enable partner countries and organisations to develop their capacities to lead, manage, achieve and account for their development priorities" (UNDG, 2007). It comprises 5 steps as illustrated in Figure 2.2 UNCAF helps to prioritise long term capacity development and impact, and help to identify potential risks and risk management strategies to help stay on initially set objectives.

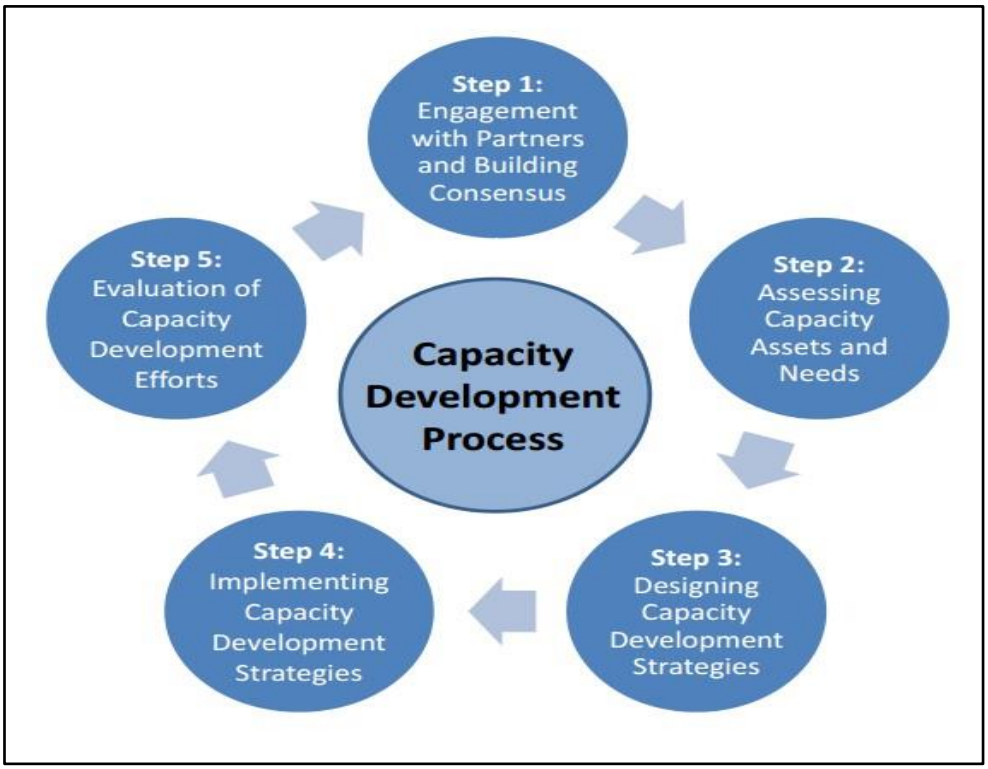

Figure 2-2: UNDP Capacity Development Process (UNDG, 2007)

It can be noticed in Figure 2.2 that no reference is made to risk management, preparedness, response and recovery, but key emphasis is placed on development related aspects. This capacity assessment framework, despite having a structured process similar to the disaster management continuum, focuses primarily on development related aspects. This suggest that its key aim is to enhance the recovery process after an event have occurred. Therefore, the gap in this framework shows that a research like this which focuses on capacity assessment for response is important in order to reduce the impact of disaster anywhere.

2.3.2 FEMA -USA Capability Assessment for Readiness Framework

USA is another country identified to have initiated national Capability Assessment for Readiness (CAR) system for self-analysis by individual states in 1997 (FEMA, 2014). CAR

provides a framework for planning and assessment at both State and Federal agencies level. It covers all disaster management functions and enable development of a nationwide representation of capabilities, resources, and assets to deal with disasters from each State's perspective. Analysis done as part of the CAR framework provide State planners a framework to build an emergency management system (FEMA, 2014). CAR process examines operational readiness and capabilities of government organisations to mitigate against, prepare for, respond to, and recover from disasters (FEMA, 2014). While this is stated in the legal obligations for emergency management in the US, management of events in the past two decades suggest the CAR framework might be inadequate or not implemented properly. The CAR focuses on the following 13 Emergency Management Functions (EMFs):

1. Operations and Procedures
2. Hazard ID and Risk Assessment
3. Logistics and Facilities
4. Hazard Management
5. Training
6. Resource Management
7. Exercises
8. Planning
9. Public Education and Information
10. Direction
11. Control and Coordination,
12. Finance and Administration
13. Communications and Warning (FEMA, 2014)

Despite the range of aforementioned Emergency Management Functions, embedded as part of CAR framework, there is no stated arrangement that indicate who the target users are of EMFs and how existing efforts are enhanced, nurtured and utilised as emphasised in the definition of Capacity Assessment. Secondly, no reference is made to skills and capabilities of people and institutions at different levels and how the range of skills and capabilities are utilised for readiness and response. An evaluation of the CAR framework has helped to identity gap and merits of the framework, which also points to key areas that this research aims to contribute to.

2.3.3 UK National Capabilities Survey

UK National Capability survey focused on emergency functions similar to above mentioned US approach, but with several criteria. It is a government sponsored UK-wide survey to assess the extent of current national, regional and local capability as defined in the UK Capabilities Programme. The Key objective is to enable the analysis of capability gaps at each level. The Capabilities Programme is the core framework through which the Government seeks to build resilience across the UK. Aim of survey is, "to ensure that a robust infrastructure response is in place to deal rapidly, effectively and flexibly with the consequences of civil devastation and widespread disaster inflicted because of conventional or non-conventional disruptive activity" (NAO, 2008).

UK National Capability Survey aim aligns with the merits of the UNCAF capacity arrangement, which emphasise the need to have an objective for capacity assessment (UNDG, 2007). Key objective of the UK capabilities mechanism includes developing a clear picture of current level of capability, providing data to stakeholders to assess their capacities and provide vital information to the wider community to contribute to overall resilience in the UK. Figure 2-3 shows key questions asked in the survey to help evaluate the capabilities in terms of risks and consequences of events that can disrupt public safety in the UK.

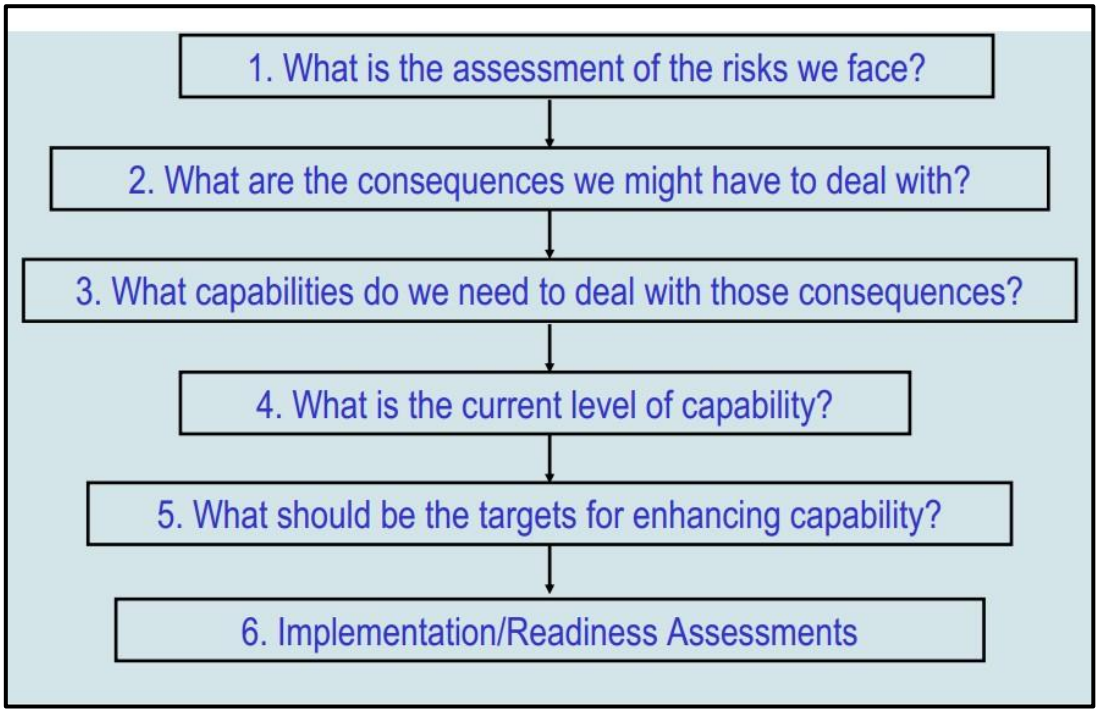

Figure 2-3: Key questions asked in UK National Capabilities Survey (NAO, 2008)

While Figure 2-3 outlines the types of questions asked to encourage stakeholders assess their skills and capacities for dealing with any risks and its consequences, Figure 2-4 focuses on the connecting response capacities at different levels of government, with essential services and EM functions capabilities.

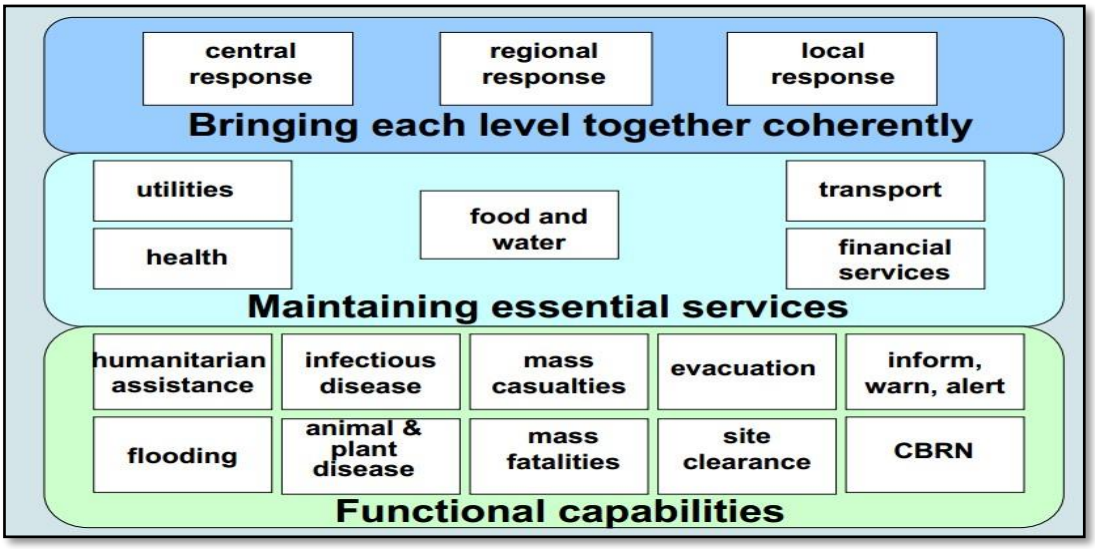

Figure 2-4: UK National Capability Work streams (NAO, 2008)

In comparison with Figures 2.3, which focuses on identifying existing capacity, Figure 2.4 focuses on bringing governmental levels of response capacities that relates to risks that need to be dealt with. It also identifies essential services and functional capabilities for ensuring that the level of readiness translates into effective response which reduces or prevents the consequences of any disruptive event. It can be seen that the capacity assessment arrangement in the UK is more comprehensive and focused on risk and consequences and links readiness with response by bringing all stakeholders at different levels together in a coherent manner for planning and response. Taking a clue from this, it is also noticed that countries such as Japan, New Zealand and Taiwan, which are prone to natural events that can cause severe consequences, also have a structured capacity assessment system focusing on the response phase.

2.3.4 Japan Emergency Capacity System

Japan is located in a seismically active belt and is an earth quake prone country thus, accurate assessment of emergency capability is critical to this island nation. Japan has adopted a four-tiered disaster emergency response system (Figure 2-5). Disaster emergency response system

include emergency preparedness system, emergency information systems, and disaster emergency government and social forces alliance system (Shuhei, 2014).

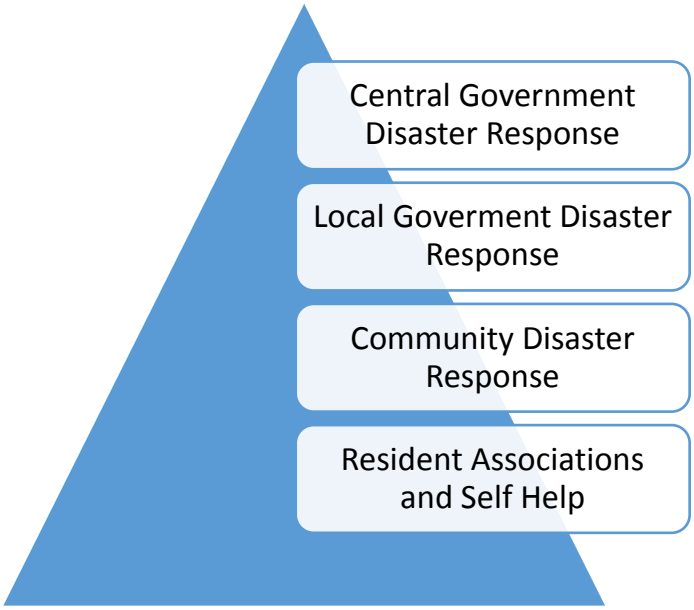

Figure 2-5: The four-tiered Japanese Disaster Emergency System (adapted from Shuhei, 2014)

This four-tiered system emphasises in the significance of having a comprehensive system that links preparedness system with response, but ensuring that stakeholders are informed and aligned (FAO, 2004; Alexander, 2005). For instance, national disaster management plans are modified by local governments to accommodate city emergency needs (Shuhei, 2014). For instance, after Great Hanshin earthquake, a comprehensive analysis and assessment of local government emergency management was undertaken, in accordance with the emergency command, emergency information systems, refuge facilities, and storage of relief supplies, emergency medical system etc.

An analysis and assessment of various emergency response systems highlight the need for a cyclical approach, where in order to effectively respond to future incidents, teams must gather information from response to previous event in the immediate aftermath of an incident occurring. Thus, indicating that an objective and comprehensive capacity assessment can only be determined during the post-response phase, in order to identify areas of improvement and if capacity for response was sufficient in view of managing future disasters. The need to identify gaps is noticed in the capacity assessment system used in New Zealand as discussed below, for achieving their goal of being a resilient country.

2.3.5 New Zealand Capability Assessment Tool

As part of the Government of New Zealand's 'Resilient New Zealand' vision, national assessments are conducted on periodic basis (Civil Defence NZ, 2014). A key objective of such regular assessments is to ensure that areas of "strengths and weaknesses are identified, to note any trends in capacity and capability, identify gaps, or areas for improvement, and to monitor progress with capacity and resources of different locations in the country for dealing with the risk and hazards they are prone to" (Civil Defence NZ, 2014). An assessment tool is developed with an aim to create a standardised approach to emergency assessment in New Zealand.

This system adopts elements of capacity assessment systems in other countries such as the UK 'National Capabilities Survey', and the US 'Capability Assessment for Readiness' by using key performance indicators and capability criteria for determining level of readiness and response, sufficient for dealing with risks and hazards. The improvement in the New Zealand system is that it also adopts best practice from the system in Japan (Section 2.3.4), which also conducts comprehensive capacity assessment in the post response phase. The improvement in the New Zealand capacity assessment system is that, rather than conducting assessment in the post-response phase, capacity assessment is conducted on periodic basis in order to identify trends in capacity, capability, gaps and areas for improvement.

This enables external assessment or self- assessment by organisations, communities at risk and different Civil Defence groups across the country (Civil Defence NZ, 2014). This periodic comprehensive capacity assessment ensures that that the sum of effort needed to nurture, enhance and utilise the skills and capabilities of people and institutions at all levels (locally, nationally and regionally) are as reflective and objective as much as possible. However, understanding the performance level of all stakeholders and their capacity to deal with disasters when they occur can be challenging, hence the focus of this research to identify critical success factors required for more effective capacity assessment system.

2.3.6 Taiwan Disaster Emergency Capability Assessment

Taiwanese emergency management sought to have both a comprehensive and performance orientated capacity assessment system. Due to this, the emergency capacity assessment approach in Taiwan uses different systems according to different objectives. Performance assessment approach uses eleven major categories including "general, disaster potential analysis, distribution of relief resources, disaster response units for each stage of the division of labour and responsibilities, disaster case investigation and analysis, storm and flood emergency response, earthquake emergency response, disaster response common to other types of measures, disaster management, attachments, and others" (Deng et al., 2005). This system is designed to ensure that sufficient capacity is developed for responding to different hazards the country is prone to. The Index system used for determining emergency capability assessment is presented in Table 2.1. The primary and secondary indexes are used to evaluate the performance, level of capacity and sufficiency and coherence of response between all stakeholders for all hazards.

Table 2-1: Emergency capability evaluation index

Target Layer	Primary indexes	Secondary indexes
City emergency Capability	• Predicate crisis prevention and early warning • Capabilities • Disaster response and disposal capabilities • Post disaster recovery and reconstruction capabilities	• The law and the plan establishment • Monitoring and early-warning the emergency management organisations • Training, exercise, and education • Risk analysis and other emergency response systems • Professional teams and volunteers command, control and communications on the scene planning and management of logistics • Post disposal • Funds to support recovery and reconstruction

2.3.7 Evaluation of Capacity Assessment Methodologies

It can be observed from the evaluation of different capacity assessment systems and frameworks used by the UN, US, UK, Japan, New Zealand and Taiwan, that there are different

limitations and merits within each of the reviewed system. Conducting this evaluation have also helped to identify areas of gaps and the relevance of this research to investigate why those gaps exists and strategies for bridging the gaps to ensure more effective capacity assessment. Capacity assessment framework is required to have structured arrangement that focuses on long and short-term impacts of risks (UNDG, 2007), as identified in the UN capacity framework.

Capacity assessment system should have readiness arrangement that focuses on Emergency Management Functions (EMFs), as seen in the US system. Although 13 EMFs were stated in the CAR process, the emphasis in this framework used in the US is that capacity assessment system should cover every action and activities for preparedness (FEMA, 2014). Taking a clue from conducting survey used in the UK, all stakeholders must be asked critical questions in relation to risks, consequences, level of capability and implementation of readiness for response (NAO, 2008). It is also important for capacity assessment system or framework to facilitate coherent coordination between different response levels, essential services and functional capabilities (NAO, 2008). These elements are derived from evaluating the UK capacity assessment system.

Capacity assessment will thrive with a focus on understanding the capacity of central government for response, local government, community and resident groups to respond to risk they are prone to (Shuhei, 2014). The four-tiered system used in Japan emphasises comprehensive analysis and assessment in relation to risk and resources and equipment for dealing with them. The Japanese capacity assessment system indicate that gaps and objective assessment are conducted post response to evaluate sufficiency of response capacity. The New Zealand assessment tool for capability assessment focuses on identifying gaps, areas of improvement, strengths and is conducted periodically and not just in the readiness phase.

Capacity assessment as used in Taiwan focuses on performance indicators using primary and secondary indexes that is multi-hazard in approach. This ensures that capabilities for response focus on hazards and requirement for reducing consequences peculiar to different hazards (Deng et al. 2005). The flow of evaluation and analysis have thus helped to identify the following important characteristics of capacity assessment outlined in Table 2.2

Table 2-2: Best Practice in Capacity Assessment

Capacity Assessment best practice features	Country identified or source
▪ Structured approach ▪ Focus on short and long-term impacts of risks	UN (UNDG, 2007)
▪ Readiness arrangement that focuses on EMFs ▪ Cover all readiness actions and activities during the preparedness phase	US (FEMA, 2014)
▪ Conduct survey or ask critical questions from all stakeholders ▪ Critical questions should focus on risk consequences, level of capability and implementation of readiness arrangement for response	UK (NAO, 2008)
▪ Focus on 4 levels i.e. central government, local government, community and community groups to respond ▪ Comprehensive to cover all phases ▪ Conduct evaluation post response to determine if capacity i.e. equipment, skills facilities, resources were sufficient	Japan (Shuhei, 2014)
▪ Tool that identifies gaps, areas of improvement, strengths and weakness ▪ Periodic or regular assessment must be done	New Zealand (Civil Defence NZ, 2014)
▪ Performance indicators should be used ▪ Primary and Secondary indexes must be defined and used ▪ Capacity assessment system/framework must be multi-hazard that ensures that consequences of hazards are prevented and risks are mitigated	Taiwan (Deng et al. 2005)

These peculiar characteristics identified from all capacity assessment systems identified and evaluated above are considered as best practice, for which capacity assessment frameworks or systems can be evaluated against. Thus, the evaluation of existing systems and frameworks as done in this Section is important for evaluating the existing capacity assessment in Saudi Arabia, as well as inquiry process for this research for achieving the research objectives.

2.4 REVIEW OF EXISTING CAPACITY ASSESSMENT APPROACHES IN SAUDI ARABIA

Within KSA, Ministry of Interior conducts professional development activities for various staff in the area of civil defence and is responsible for emergency management. Interior Ministry (2013) describes their approach to professional development as a "group of specialists in the scientific fields related to the civil defence and being responsible for the teaching and training processes to ensure disaster readiness. These specialists are staffs related to universities and specialized science centres, or officers and non-commissioned officers affiliated to the institute of the civil defence and its general directorate, in different fields. The fields are sectors or units dealing with emergency cases, civil protection, safety, fire, rescue, first aid, investigating in the accidents of the civil defense, chemistry, physics, administration and law, computers, telecommunications, and other helping sciences" (Interior Ministry KSA, 2013).

According to Interior Ministry KSA (2013), disaster management is divided into 4 phases. Definition of disaster management as used by Interior Ministry (KSA) is consistent with other definitions as reviewed in Section 2.2, as discussed earlier in this chapter. Various phases are related to each other and key phases include:

1. Preparedness phase
2. Response phase
3. Recovery phase
4. Assessment & Evaluation phase

However, the senior management is represented within different team of disaster management in order to implement instructions of senior management in the field. This decision-making process helps to solve problems that might pop up at any time during disaster management. For example, Figure 2-6 and 2-7 show the task flow, action plans and decision making process for emergency response phase.

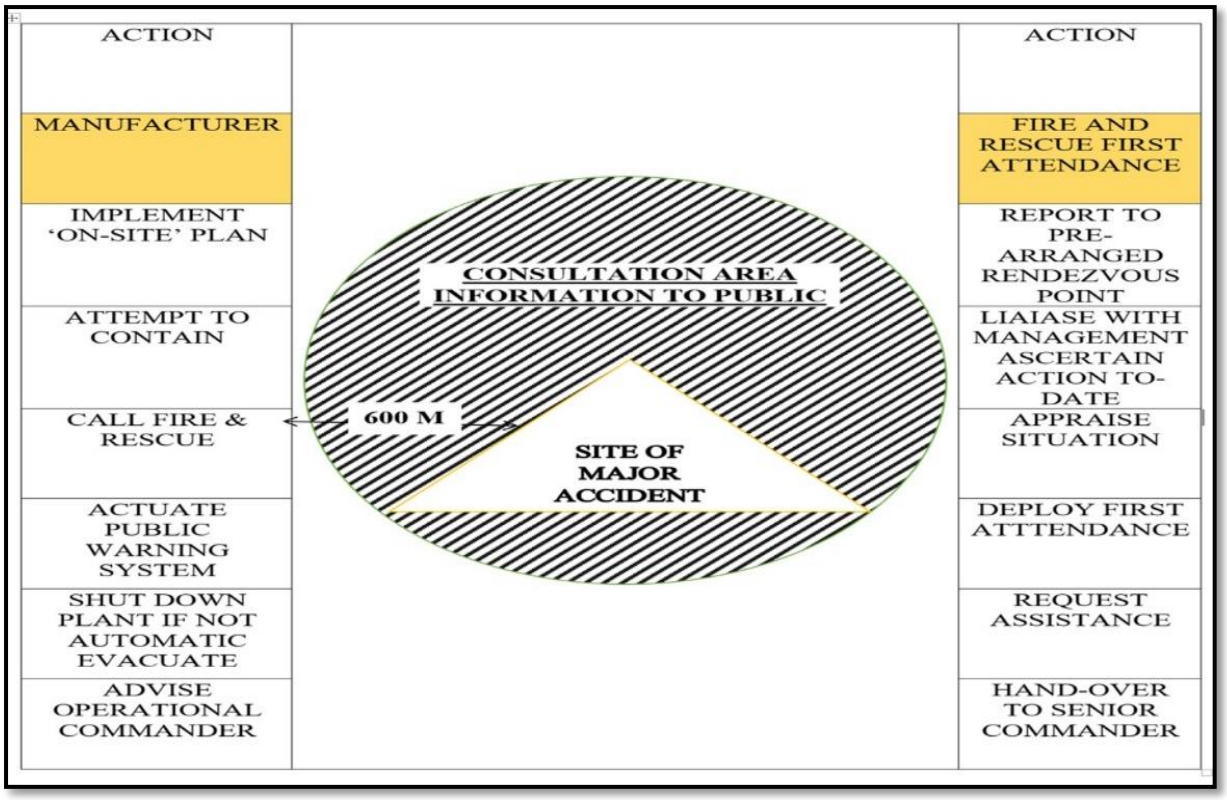

Figure 2.6: Workflow of emergency response – Stage 1 (Interior Ministry KSA, 2013)

On the left-hand side of the workflow (Figure 2-6), on-site emergency plan is illustrated whilst, on the right-hand side, the off-site management area for personnel is shown. The equipment used for response by different official bodies and their stations and their role in the emergency management process, including the ministry of interior and other ministries and agencies are also shown in the Figure 2.6. Stage 1 primarily involves assessing the major accident scenario as stated in the top right hand corner. In comparison, the stage 2 involves the roles and involvement of the senior commander. The decisions and actions initiated by the senior commanders and management is illustrated in Figure 2.7.

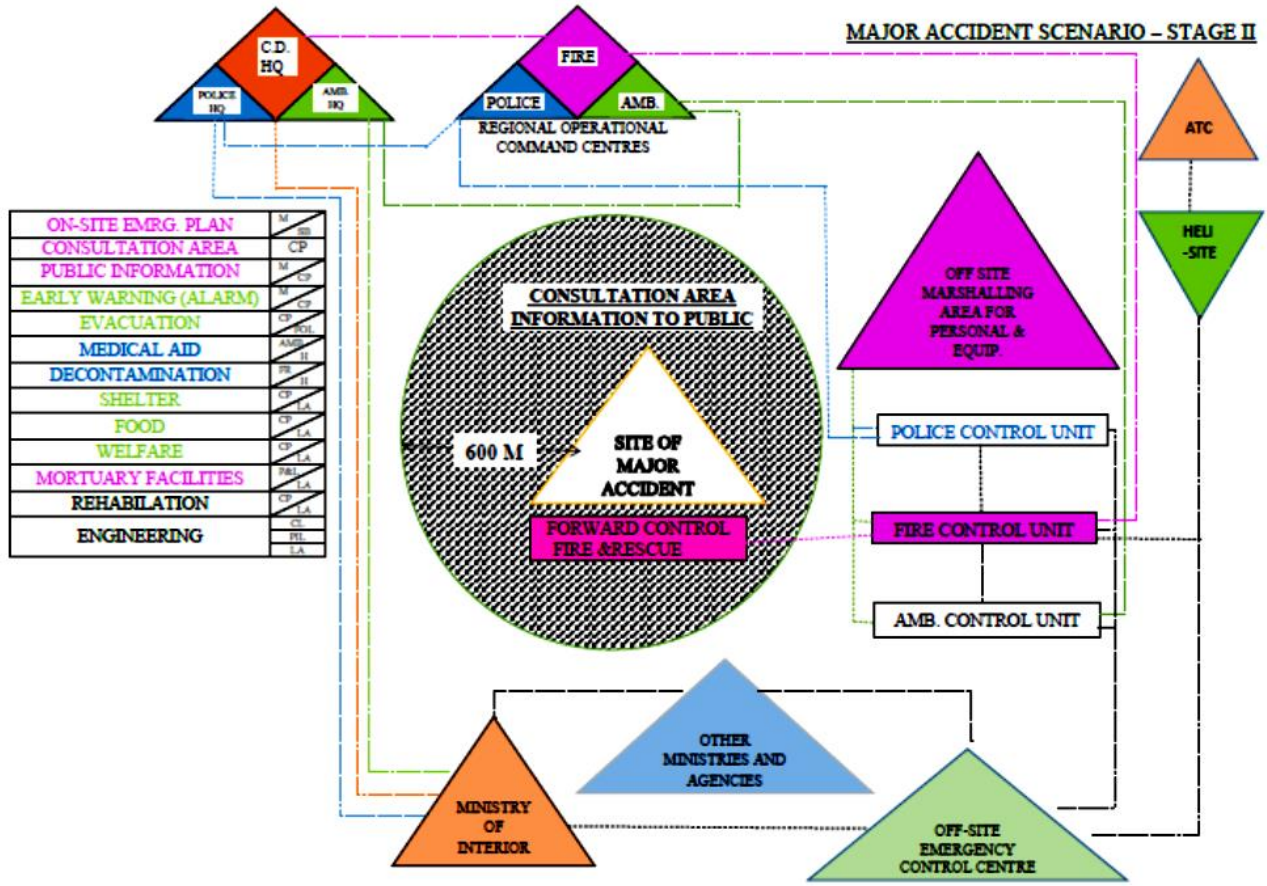

Figure 2-7: Workflow of Emergency Response – Stage 2 (Interior Ministry KSA, 2013)

Figure 2.7 shows the breakdown of actions, designated areas for different agencies and various interactions involved in the response phase. Role of various agencies is also shown. It also shows that the possibility for confusion or breakdown in communication to occur due to the presence of different agencies such as the police, fire and ambulance, as discussed in detail by Dillon et al (2009). However, it also illustrates the overwhelming responsibilities that the ministry of interior has in coordinating other ministries and required actions for an emergency. Thus, responsibilities are shared between the following key organisations who are responsible for civil defence within KSA:

- Civil Defense Council
- Preparatory Committee for the Civil Defense Council
- Local committees for Civil Defense
- General Directorate of Civil Defense

While Figure 2.6 and 2.7 illustrated, the operational activities required for dealing with emergencies, the Civil Defence Council tend to be more responsible for policy development of civil defence plans and projects. In addition, it is responsible for implementation and monitoring of various civil defence projects and policies. This is made possible through the following ministries and leadership structure, as outlined in Table 2.3.

Table 2-3: Roles and status of the Civil Defiance Organization

Job Role	**Status**
Interior Minister	President
Deputy Interior	Vice President
President-General of Meteorology and Environment protection	Member
Chief of the National Guard for Executive Affairs	Member
Assistant Interior Minister for security Affairs	Member
Prime Saudi Red Crescent Authority	Member
The Minister of Municipal and Rural Affairs	Member
Minister of Finance	Member
Minister of Economy and Planning	Member
Minister of Health	Member
Minister of Agriculture	Member

All abovementioned arrangements, structure and systems indicate that there is existing structure for dealing with risks of hazards. It also indicates that there are attempts and focus on managing the impacts of disasters. However, it seems the existing way of dealing with disasters is insufficient. Inadequacies of existing disaster response efforts have previously been highlighted in Chapter 1. A better co-ordinated approach is required to respond to both man-made and natural occurring disasters within KSA. For example, the man-made disasters are ones which include Motor Vehicle Crashes (MVCs), which is considered to be the primary source of mortality in Saudi Arabia (Ministry of Interior, 2008).

MVCs have increased as a result of increased number of vehicles and drivers in recent years, often coupled with lack of enforcement and reckless driving (Al-Tukhi, 1999; Ministry of

Interior, 2008). Al-Tukhi (1999) identified that Saudi Arabia has high rate of traffic incidents including pedestrian incidents. Disasters include natural ones such flood and rains, thunderstorms, etc. and man-made disasters like riots and stampede during the Hajj season, accidents to mention a few. There are also different acts of terror like the terrorist attacks in 1996 in Khobar and seizure of the Holy the Mosque in Makkah in 1979. The natural disasters are ones which cause serious disruption, but triggered by natural hazard causing human, material, economic or environmental losses, which exceed the ability of those affected to cope (Longley et al, 2006).

Natural hazards can be Weather-related such as storms, flooding and/or geophysical earthquake, volcano and landslides (Longley et al. 2006). The impact of these hazards depends on the level of exposure of people and environment to the hazard activities and other human-related factors (Humanitarian Practice Network, 2006). The International Disaster Database (IDD, 2010) of the WHO provides glimpse about the history of disasters in Saudi Arabia, some of which had also been examined by Thompson et al. (2004). The second major disaster event results from the mass gathering of pilgrims in Ramadan (the fasting month) and the Hajj seasons.

These are considered to be special seasons in the Islamic calendar where millions of people from across the world converge in the Holy cities of Macca and Medinah. According to the Ministry of Interior, the history of developing emergency plans in KSA dates back to 1927, when first fire brigade was established to serve the pilgrims. Regardless, organisation of these key events places a huge strain on emergency responders with law-enforcement officials expected to work to their full capacity during Holy months. There are also technology-influenced hazards and disaster.

A key reason for such disasters is very often malfunction of equipment or its breakdown (Al-Suwian, 2001). KSA oil industry is prone to such disasters particularly during the production phase (Al-Suwian, 2001). However, in recent years such disasters have been reported in industries, other than oil industry (Ministry of Interior, 2008). The disasters timeline and impacts are shown in Table 2. 4.

Table 2-4: Disasters in Saudi Arabia (International Disasters Database)

Disaster	Date	Killed	Affected
Rains	1964	20	1000
Fire during Hajj season	1975	200	NR
Seizure of the Holy Mosque in Makkah	1979	250	600
Ras al-Khaafji thunderstorm	1982	11	NR
Flood	1985	32	NR
Riot during Hajj season	1987	402	649
Stampede during Hajj season	1990	1426	NR
Stampede during Hajj season	1994	270	NR
Khobar terrorist attack	1996	19	555
Yanbu flood	1997	10	NR
Asir flood	1997	16	NR
Fire during Hajj season	1997	343	1500
Meningitis during Hajj season	2000	57	NR
Rift Valley fever out break	2000	87	500
Flood in Makkah	2002	19	NR
Flood in Makkah	2003	12	NR
Bombing in Riyadh	2003	34	194
Flood in Jizan	2004	13	NR
Flood in Medina	2005	29	94
Flood in Riyadh	2005	7	700

While number of records in Table 2.4 are shown as NR (i.e. “None Recorded”), it can be seen in Table 2.3 that incidents occurring during Hajj and flooding seems to be most prevalent disasters in Saudi Arabia. Although their impact varies from year to year, the incidents seems to be recurring, with different impacts when they occur. This shows that capacity assessment to assess readiness for responding to these recurring incidents need to be conducted, therefore indicating a gap in the current disaster management strategies in Saudi Arabia. It also emphasises the relevance and significance of this research to develop a capacity assessment framework that can enhance disaster preparedness and response capabilities in KSA. The next Section seeks to critically evaluate the existing capacity assessment in Saudi Arabia, in order to determine areas of improvement or aspects that require development.

2.4.1 Evaluation of existing disaster response capacity assessment in Saudi Arabia

The review of the existing structure in the KSA disaster management sector shows that there are systems in place, manpower, resources and equipment designated for dealing with disasters, either natural or man-made. However, little or no reference is made to capacity assessment system or framework for determining the effectiveness of the disaster management phases. It is also unclear whether the best practice identified in Table 2.2 exists in the current system. The evidence of structure and system in place for response that focuses on reducing the short and long-term impacts of risks, indicate that the best practice identified in the UN capacity assessment framework exists also in KSA.

However, it is unclear from the above review if other best practice listed in Table 2.2 identified from US, UK, Japan, New Zealand and Taiwan are in place. Such vagueness further highlights the significance of this research, especially objective two which aims to identify and evaluate existing capacity assessment methods and approaches used for disaster preparedness and response within Saudi Arabia, in order to help establish an accurate baseline. Also, the continued occurrence and impacts of certain disasters such as incidents during Hajj and flooding also show that response capacity is not effective or sufficient for reducing the consequences of disasters in KSA. While this further justifies the purpose for this research, it also suggests that perhaps challenges exist that hinder preparedness and response phases which makes response less effective.

2.4.2. Review of Existing Programmes for Disaster Management

Within KSA, Ministry of Interior conducts professional development activities for various staff in the area of civil defence and emergency management. Ministry of Interior KSA has group specialists in specialist fields related to civil defence, who are engaged in teaching and training processes as well. These specialists are from the staff related to the universities and specialized science centres, or officers and non-commissioned officers related to the institute of the civil defence and its general directorate in the following fields: "facing emergency cases, civil protection, safety, fire, rescue, first aid, investigating in the accidents of the civil defence, chemistry, physics, administration and law, computers, telecommunications, and other helping sciences)" (Interior Ministry KSA, 2013).

According to the Interior Ministry KSA (2013), disaster management is divided into 4 phases – these phases are related to each other and the top management is represented with the team of disaster management which connects with leadership and instructions in the field, and solving of problems that might pop up at any time during disaster management. Disaster management phases include:

Preparedness phase

Preparedness minimizes hazard's adverse effects through effective precautionary measures that ensure a timely, appropriate, and efficient organization and delivery of response and relief action. Preparedness actions and activities can be divided according to recipient. The government component, which includes administration, emergency management, public health, and other services agencies, is one group. Individuals and businesses are the second group. The government preparedness actions may be grouped into five general categories: Planning, exercise, training, equipment, and statutory authority.

- **Planning:** Emergency and response planning at the government level is a necessary and involved process. In the event of a disaster, each government jurisdictional level will be expected to require performing a range of tasks and functions in the lead up to its aftermath.
- **Exercise:** A major part of the preparedness efforts of a community or country's response capability is a range of exercises. Response exercise allow those involved in emergency and disaster response, exercise also serve a very important preparedness function: introducing individuals and agencies involved in response to each other.

- **Training:** response officials may place their lives in unnecessary and grave danger if they are not adequately trained in the particular of specialized response. Untrained or insufficiently trained responders add to the possibility of secondary emergency or disaster, and further strain response resources by diverting officials to manage responder rescue and injury care.
- **Equipment:** The development of tools and other equipment to assist in disaster response and recovery has helped response agencies to drastically reduce the number of injuries and deaths and the amount of property damaged or destroyed as a result of disaster events.
- **Statutory authority:** Government response actions involve a diverse range of government officials and agencies interacting with the public and with businesses and operating on public private land. Statutory authorities ensure that emergency and disaster response agencies and functions are established, staffed, and receive regular funding.

Preparedness is a comprising measure to enable government organizations, communities and individuals to respond rapidly and effectively to disaster situations (Ishak, 2005). One aspect of the preparedness which is not always given adequate priority is individual and / or family preparedness. In many circumstances where government resources and emergency services are limited, such individual and family preparedness may be vital for survival.

Examples of preparedness measures are: the formulation and maintenance of valid, up-to-date counter disaster plans which can be brought into effect whenever required, special provision of emergency action, such as the evacuation of population or their temporary movement to safe havens, the provision of warning systems, emergency communication, public education and awareness (Elena & Bessis, 2010). Figure 2.8 presents a summary of key stages within Disaster Management process as laid out by Ministry of Interior. Common methods, techniques and approaches to education in raising public awareness include (UNDP, 2005):

1. Individual communication with public through meetings
2. Dissemination of the indigenous knowledge through performance and arts
3. Training programmes targeting the community level
4. Structured training and educational programmes at schools
5. Printing materials and audio-visual resources
6. Mass media interviews and articles in newspapers.

7. Response phase
8. Recovery phase
9. Assessment & Evaluation phase

PREPAREDNESS	RESPONSE
1. Disaster prediction: study and analysis 2. Preparing plans, systems, frameworks, and determination of its missions 3. Precise determination of control and field leadership 4. Training of the participants for implementing the plans (official;/private) 5. Performing the theoretical and practical aspects of the pre-prepared plans 6. Arrangements and co-ordination for participating parties (official/private/volunteers) 7. Determination of facilities and the support from all parties and updating of information	1. Implementing of plans, missions (warning plan, information plan, medical evacuation plan, rehabilitation, rescues and support of volunteers. 2. Implementing plan for technical and human support and providing logistical support for the workers. 3. Plans of co-ordination and regulating and combing the efforts and the facilities. 4. Dealing with any insufficiency in plans and facilities. 5. Flexibility and passing and receiving of information 6. Leadership and instructional unit and guidance for all staff involved in disaster mitigation 7. Precise monitoring that is necessary to continue the duties and avoiding shortcomings in the implementation
RECOVERY	**ASSESSMENT AND EVALUATION**
1. Implementing recovery plans. 2. Implementing of relief and rehabilitation plans. 3. Revalidating the affected areas and reconstruction. 4. Affording medical care and rehabilitating the affected areas. 5. Rehabilitation and ensuring safety of residents and declaring that the danger is over. 6. Treating the physical and psychological effects. 7. Documenting the procedures and recording and updating the information.	1. Knowing the reason for disasters, with study and analysis. 2. Determining the advantages and disadvantages for the disaster, avoiding disadvantages and developing the advantages. 3. Planning of future solutions for the disasters to avoid any future occurrence. 4. Building of systems that capable of specifying the problems and co-ordination with all the sectors (official/private/volunteers). 5. Feasibility study for using modern technology for disasters mitigation. 6. Evaluating the co-ordination and rearrangement for all the participants in disasters management with transparency. 7. Conducting statistical to document all the information and duties to be available for the staff

Figure 2-8: Summary of Key Disaster stages as laid by Ministry of Interior- KSA (KSA, 2013)

The key stages of disaster management in KSA shows that there is structure, activities and process for dealing with disasters. The three phases; preparedness, response and recovery are consistent with

ones practiced in many countries globally, but the assessment and evaluation are peculiar terminology to KSA. This stage makes references to mitigation and planning solutions for disasters, which is in theory similar to mitigation or reduction phase used in countries examined in this research.

2.5 CHALLENGES IN EFFECTIVE DISASTER RESPONSE

Based on results of the literature review, this Section reviews various factors hampering effective disaster response in general, with a specific focus on disaster response efforts within KSA.

2.5.1 Social and Demographic Causes

In 2007, within KSA, illiteracy rates were 23.6% in females and 8.6% of males, in age category of those aged over 15 years (Ministry of Economy and planning KSA, 2010-2014). These factors are related to social and demographic causes such the high rate of illiteracy and language barriers. Many illiterate sectors of the Saudi population cannot read the safety brochure and emergency leaflets, that affect their attitudes towards understanding the emergency and its impact on their lives. Language barrier among expatriate workers in Saudi Arabia, who do not speak Arabic, can also have a negative effect on emergency readiness. Lack of understanding of Arabic and presence of large number of multi-lingual immigrant population gives rise to communication problems, making the minorities in Saudi Arabia more vulnerable to disasters.

2.5.2 Lack of Early Warning Systems

A study published by Momani et al (2010) investigated the response efforts to flood disaster that happened in Jeddah city in 2009 and highlighted lack of emergency management plans and bodies. Momani et al (2010) found that there were no early warning systems in place to inform the population in a timely manner. Lack of usage of modern technology resulted in delays in detecting the missing people. A research study by Bin-Saud (2007) entitled “The role of media agencies in dealing with security crises”, reviewed the role of security services managers in Saudi Arabia. The study aimed to uncover the extent of co-ordination between those in charge of media devices to meet the security crises. The study found a number of results, which include;

- There are shortcomings in the media discourse to confront the security crises to raise the degree of readiness of security to the public.
- There are shortcomings in the information security plans to respond to crises.
- Poor coordination and communication among the parties of Crises Management.
- There are shortcomings in the planning and implementation of security plans operations.
- There are shortcomings in leadership training for disasters.

This study highlighted the need for improvement within existing disaster response efforts.

2.5.3 Governmental Bureaucracy

Momani et al (2010) highlighted that the Governmental bureaucracy further slowed down the possibility of effective disaster response. The lesson learned from Jeddah dictated the need of a mechanism for reporting of natural hazards and considering the suitable measure in preventing and dealing with such crisis and disasters. The authors conclude that the change in the public policy is crucial in enhancing the capabilities of any future disasters, as it is right direction that the government declared that negligence was the main reason behind tackling Jeddah crisis, they mean also there is a need to establish a mechanism to fight the corruption and the abuse of power, the authors came out with a number of recommendations that can be useful in managing any future disaster or crisis in Saudi Arabia.

2.5.4 Lack of Leadership and Crisis Management

Leadership and crisis management Crisis management is defined as organization' pre-established activities that include preparing and responding to significant catastrophic events in effective and safe procedures (Nancy, 2005). Crisis management involves organization pre-established activities and guidelines for preparing and responding to a significant catastrophic event in a safe an effective manner (Lockwood, 2005). Leadership role in encouraging crisis team members to engage in strategies to resolve the crisis is crucial in effective crisis management (Dutton & Jackson, 1987).

It is important that leaders develop a set of skills that necessary in helping them to manage the crisis effectively (Garcia, 2006). Leaders must adopt a competency-based approach in dealing with crisis management; they must take the direct responsibility of steering a work environment that infuses

that approach (Bass, 1985). The identification of the essential activities and task during the crisis situation are needed, and the competencies are required to complete the activities successfully.

The need for an effective management become important as an organization enlarges in its size, and its functions become complex (Bamford and Forrester, 2003), and performance and management practices are linked to each other (Mitzberg, 2003). The study by Harbi (2008) "strategic planning for the development of civil defence in the Kingdom of Saudi Arabia" revealed the following:

- The most important research results, which held 250 of the Civil Defence officers in Saudi.
- Planning is still below the required level due to lack of a culture and strategic leadership.
- Poor co-ordination between the administrative levels of the civil defence plans to activate the Strategy.
- Lack of administrative units high for strategic planning and the lack of an effective system of control and follow-up.

These results confirm the issues examined in this section and emphasises the need for improvement in order to better deal with disasters.

2.5.5 Lack of Training in Crisis Management

Training for disaster and crisis management teams is the most effective way in the process of dealing with and preventing disasters and crisis which might happen at any time and in anywhere suddenly. Well known and predefined training objective, performance monitoring and measurement and careful instructor observation and coordination offer the trainees strong guidance to get specific skills, increasing the ability of the instructor to adjust the training and provide an appropriate level (Rankin et al, 2011). A research on the efficacy of training for facing disaster and crisis in KSA by Bin Ottai (2004) reveal that;

- The most important skills the trainees acquired are the ability to make quick decisions for facing the crises, and also the ability to co-ordinate with the connecting authorities and finding the suitable solution for facing a disaster.
- The most important and suitable methods of training for achieving the efficacy to face disasters are the previous disasters studies, and the lessons that are learned from them.

Based on these outcomes, Bin Ottai (2004) recommended that:

- Training programs should be moderated to suit the modern chance for disaster.
- It is necessary to rethink the contents of the training programs to ensure that they address the training needs.
- Design specialized training programs that can increase capacity for dealing with events and disaster.
- There is need for development of specialized training programs in disaster and crisis management.
- The shortcomings in the programs for disaster and crises need to be improved.
- Focus on training the leaders in order to develop their skills and leadership development programs contribute to the development in the face of disasters and crises.

While all mentioned factors above identified so far are specific to KSA, Son and Aziz (2012) presented a visual summary of key factors influencing disaster response (Figure 2-8) based on an extensive literature review. Identified factors can potentially hinder effective response process in KSA context as well.

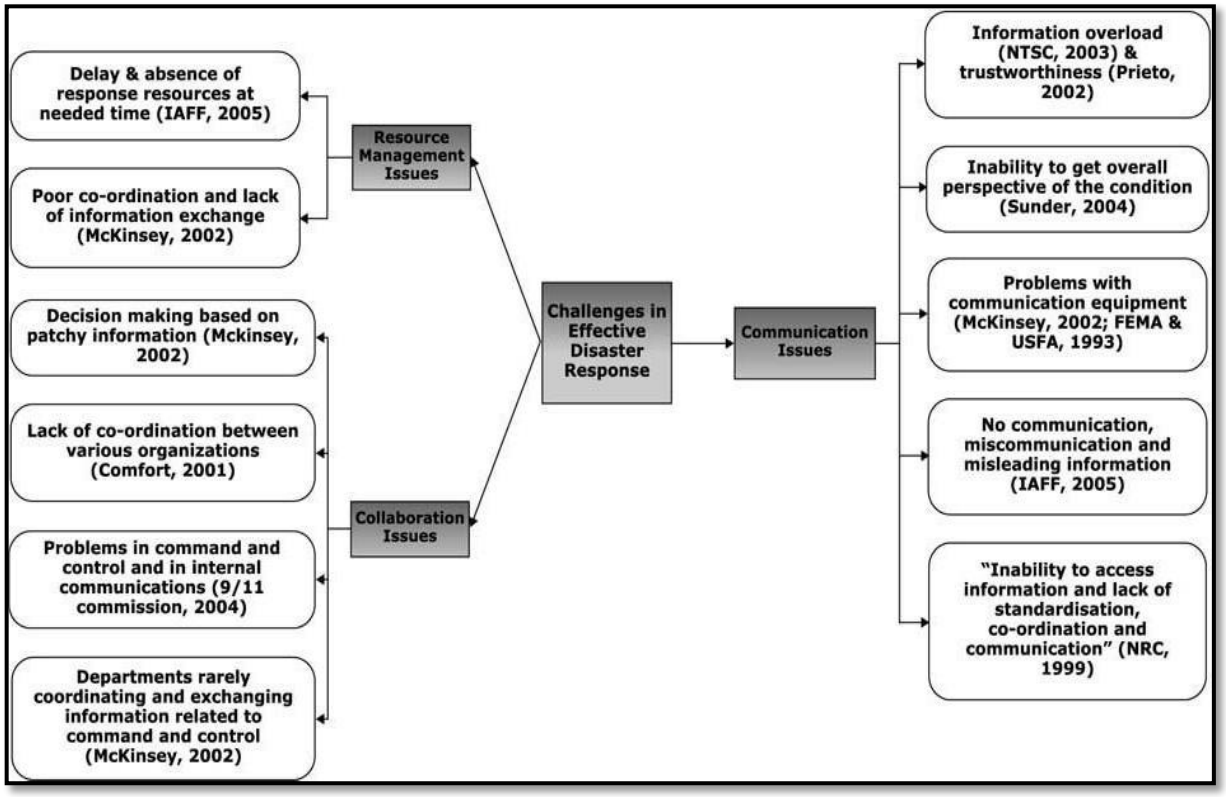

Figure 2-9: Key factors in effective disaster response (Son and Aziz, 2012)

Various factors affecting disaster response as identified in KSA within Section 2.5 and the general challenges outlined by Son and Aziz (2012) provide strong reasons to investigate the critical success factors that ensure that best practice in capacity assessment is properly conducted, leading to effective response. Therefore, the next section focuses on the critical success factors required for effective disaster readiness.

2.6 CRITICAL SUCCESS FACTORS FOR DISASTER READINESS

Even though there is extensive evidence of use of CSF within business/commercial literature, there application within disaster and emergency management domain is limited. A study by Pettit and Beresford (2009) reviewed CSF as applied to humanitarian aid situations, based on analysis of commercial supply chains. In a similar analysis on cyclone emergency relief, Oloruntoba (2009) identified five CSF (Table 2.5). A comparison of CSF as identified by each author is presented in Table 2.5.

Table 2-5: CSF in Emergency Relief Situations

CSF for humanitarian aid situations (Pettit& Beresford, 2009)	CSF in Cyclone Emergency Relief (Oloruntoba, 2009)
Strategic planning	Routine Disaster Awareness and education campaigns
Inventory management	Early Warning Systems
Transport and capacity planning	Prior Planning
Information management and technology utilization	Co-ordination between Government Departments
Human resource management	Participation of military Units
Continuous improvement	
Collaboration	

Literature review also reveals difference in use of terminology. Even where the term "critical success factor" has not been used, authors have referred to various criteria or factors that contribute towards effective disaster management. Thus, a wide body of literature was investigated to include terms such as strategies, guidelines and elements, with an aim to identify possible CSFs. In general, in post 2001 academic literature on disaster related theme, information technology utilisation is identified as a key element in effective disaster management.

In this context, Pettit and Beresford (2009) highlighted significance of effective management information system and decision support system for effective response (Pettit and Beresford, 2009). Similar views are reiterated by Power (2005), who highlighted significance of effective decision support system to manage disaster situations. Perry (2007) highlighted significance of effective training, not only is disaster relief, but also in logistics for effective disaster response. These views are supported by Oloruntoba (2009), who highlighted that logistics and coordination are key challenges in management of disasters.

Table 2-6: Identified Critical Success Factors

	Identified Factor and Brief Description	References
CSF1	**Effective Community Engagement** Effective engagement of communities within Early Warning System	Oloruntoba (2009), Pettit and Beresford (2009)
CSF2	**Effectiveness of Response Plans** Presence of clearly laid out emergency response plans and regulations	Afedzie and McEntire (2010), Oloruntoba (2005), Ozdamar et al. (2004)
CSF3	**Effectiveness of Disaster Logistics** Effectively planned Disaster logistics and presence of disaster relief supply system	Davidson (2006), Cook (1984), Pettit and Beresford (2009)
CSF 4	**Effective Inter-Organisational Structure** Clearly defined organisational structure with clear demarcation of leadership and line of authority. Clearly defined roles and responsibilities leading to effective communication and fast decision making	GAO (2006), Davidson (2006), Nisha de Silva (2001), Oloruntoba (2005), Bardach (2001), Pedro et al. (2005), Pettit and Beresford (2009)
CSF5	**Good Communications Protocols within an organization** Clearly laid out procedure for communications, reporting and submitting information during disasters	Oloruntoba (2005, 2009), Thomas and Kopczak (2005)
CSF6	**Effectiveness of Intra-organisational Communication** This involves effective information sharing between various organisations involved in a disaster response and recovery efforts; It also include social and technical structure, plus larger political and organizational environments	Dawes et al (2004)

CSF7	**Effective Disaster Planning, including Financial Planning** Good disaster planning, including financial planning and availability of agreed upon disaster relief shelters and logistics stations	Afedzie and McEntire (2010), Davidson (2006), Pettit and Beresford (2009)
CSF8	**Training of first responders**	Oloruntoba (2009)
CSF9	**Regular organisation of disaster drills**	Oloruntoba (2009)
CSF10	**Timely Response** Ability to execute disaster response plan in a short duration of time, in the immediate aftermath of the disaster	Davidson (2006)
CSF11	**Support from Army** Involvement and support from Army during disaster relief and transportation	Davidson (2006), Ozdamar et al. (2004), Pettit and Beresford (2009)
CSF12	**Application of Technology Enhancements** Application of innovative technologies e.g. mobile computing, modern logistics	Pettit and Beresford (2009)
CSF13	**Accurate and timely disaster needs assessment**	Hoda et al. (2010), King (2005), Maxwell and Watkins (2003), Nisha de Silva (2001),
CSF 14	**Continuous improvement** of the operational system of emergency management	Afedzie and McEntire (2010), Kovacs and Karen (2007), Thomas (2003)
CSF 15	**Continuous monitoring and control** of efficiency and effectiveness of disaster management practices	Barbarosoglu et al. (2002), Davidson (2006), de Brito et al. (2007), Poister (2003), van Wassenhove (2006)

The CSF outlined in Table 2.6 are crucial to the research investigation process, in that they are indicators for identifying and analysing the impacts of capacity assessment framework in KSA if any exists before what has been identified in this chapter.

2.7 KEY FINDINGS OF THE LITERATURE REVIEW

The literature review has shown that capacity assessment exists in many countries like the USA, UK, Japan, New Zealand, and Taiwan. But more significant in the capacity assessment identified in these countries are the features that make them best practice that helps to increase capability for responding to disasters of any nature and scale. The key findings reveal that there is structured approach that focuses on short and long-term impacts of risks as identified from the UN capacity model. Best practice features like readiness arrangements from the FEMA system focus on EMFs, that also cover all readiness actions and activities during preparedness phase indicate that capacity assessment is not a superfluous process, but one that is based on practical measures that increases capacity for response. However, this practical approach backed with actions are not evident in the KSA system. Those similar to the UN capacity model seems to be evident since KSA adopts UN system for disaster management.

However, the KSA appears to be insufficient in that it does not focus on long-term impacts of risks, just in using the structured approach for short-term disaster preparedness activities which does not translate into effective disaster response. The UK capacity assessment process seems to put more light on how capacity assessment may be conducted by asking questions that make stakeholders assess their capability, actions and arrangements in place. While evidence is lacking in literature or case studies that show the extent to which these capacity assessments have been effective in the countries examined, case studies of disaster that have occurred in the past demonstrate that capacity for response is sufficient, hence pointing to the effectiveness of capacity assessment systems. KSA is will do well to learn from the approaches taken by the countries examined and their capacity assessment best practice features identified and outlined in Table 2-2.

Despite limited literature on KSA capacity assessment arrangements and impacts, it is evident that the current arrangement in KSA is well structured as Section 2.4 has revealed. However, it appears

that the multi-level collaborative system which Japan uses that increases their capacity for dealing with frequent occurrences of disasters is lacking in KSA since ministers seem to be members of the Civil Defence organization as indicated in Table 2.3. But the frequent and continuous disaster events of different types especially during Hajj show that capacity is insufficient and needs to be improved. Although challenges abound, which were identified and critique in section 2.5, it may be inferred that some of the challenges identified are as a result of lack of good capacity assessment arrangement in KSA, and also factors that hinder effective response process. As a result, the key findings in literature review is illustrated in Table 2-7 below.

Table 2-7: Summary of Key findings

Assessment criteria	**KSA Status**	**Action required**
Capacity assessment arrangement	Evident, but insufficient	Require improvement based on further investigation.
Capacity assessment best practice features	Structured approach evident, but other best practice features are lacking	Investigate into why features are lacking
Challenges/hindrances to capacity assessment arrangements	5 challenges/hindrances exist, with several impacts on effectiveness of disaster response arrangement	Investigate into how challenges can be managed and prevented or investigation into how disaster response arrangement can be made more effective through capacity assessment system
Critical success factors	Identified in literature review and case studies from other countries, but status unclear in KSA	Investigate CSFs in KSA and how this can be adopted to enhance capacity for disaster response

The key findings mentioned in Table 2-7 shows that there is need for further investigation into the research themes and areas that relate to the research aim and objectives. Through further investigation, the lack of clarity and uncertainty of status in KSA will become clear. However, to

achieve the purpose for further investigation, it is important to select the appropriate methods of data collection and research design so that relevant and quality data may be collected. This emphasises the importance of the next chapter and subsequent steps taken in this research.

2.8 CHAPTER SUMMARY

This chapter presents a summary of literature in order to provide theoretical underpinning for disaster capacity assessment framework. Key concepts related to disaster management have been reviewed, followed by a critical evaluation of best practice in capacity assessment methods and approaches across the world including KSA. While this Chapter has shown that no single method and approach is perfect, it also helped to identify gaps, which require further investigation in the KSA context. Other sections in this chapter also evaluated impacts of challenges and the role of critical success factors in capacity assessment, both in Saudi and in global context. Thus, this literature review has helped to achieve objective 1, 2 and 3 by identifying gaps in the existing system in Saudi and identification of areas that require further investigation before an appropriate capacity assessment framework can be developed by the researcher.

Chapter 3 - Research Methodology

3.1 INTRODUCTION

The chapter presents research methodology designed to achieve research aims and objectives as illustrated in Chapter 1. Only through rigorous application of relevant research methods/methodologies, body of knowledge can be advanced and established (Fellows and Liu, 2008). Therefore, this chapter is divided into sections that explains, discuss and justify the selection of methods used for conducting this research in a rigorous manner that contributed to achieving the body of knowledge derived for data analysis and research outcomes. The research methodology is explained in nine main sections in this chapter and the contribution of each method theme to the research process is explained in relation to the research aim and objectives.

3.2 RESEARCH METHODS

A key focus of this research is to identify means of enhancing disaster resilience in Saudi context. Disaster resilience is an applied area of research including a wide array of subjects and approaches from management to social sciences and humanities. It is well documented that researchers need to establish a clear understanding of the existing body of knowledge in their specialisation area, which should come through an extensive literature review (Saunders et al, 2016; Yin, 2009). Likewise, the literature review of this research is to be conducted to enable the researcher to know and understand the broad area of disaster response capacity assessment.

The literature review as documented in Chapter 2 is instrumental in informing this chapter and the formulation of key research questions. This research has adopted the ‘research onion’ proposed by Saunders et al. (2016), as a guide for conducting and explaining the research methodology. The ‘research onion’ is also used to justify the reasons for selecting suitable methods for this research, while evaluating their relevance to the research topic. This is necessary because it is important that a researcher understand component and relationship between methods used in the research process and integrate them in the most suitable way to increase validity and reliability of data and results (Kagioglou et al. 2000).

Thus, a descriptive and critical literature review was undertaken to capture previous work, key concepts and potential problems in existing practice as highlighted in the literature. Lewis (2009) presented a similarly nested approach to layers, with addition of more layers including research philosophy, approaches, strategies and data collection, but emphasizing the need to use research design to understand the research problem. However, the research onion is adopted in this research due to its more comprehensive process that helps to link each layer to the next, as illustrated in Figure 3.1. However, Saunders et al., (2016) suggests that all layers must be designed and carefully planned in order to lead to a valid and reliable data collection.

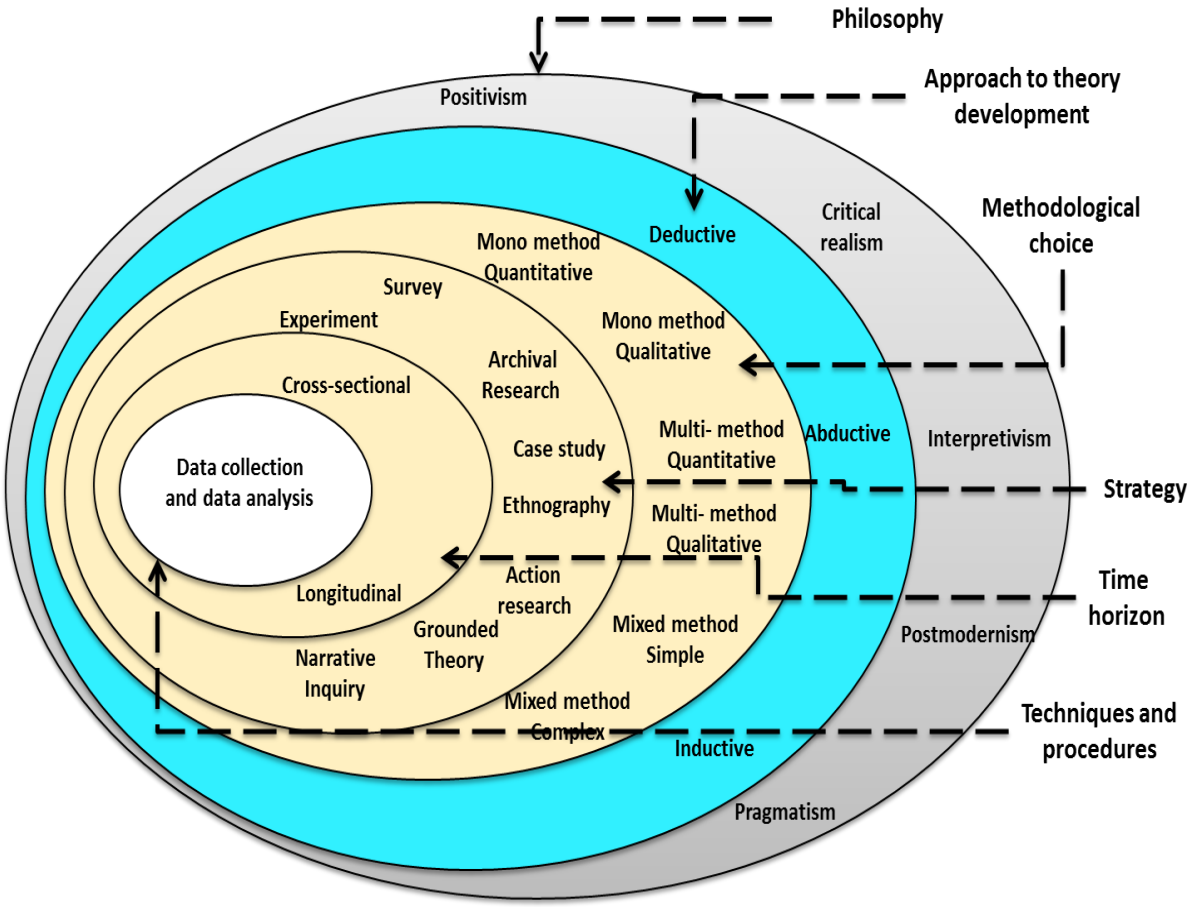

Figure 3-1: Research Onion diagram (Saunders et al., 2016)

According to Punch (2005), the 'research design' means all the issues involved in planning and executing a research project must be taken into consideration. Saunders et al (2016) states that the six layers in the 'research onion' are fundamentally influenced by the philosophical branches called

ontology, epistemology and axiology. As explained by them, understanding and choosing a philosophy is significant to planning and conducting a research (Morgan, 2007). This view was also emphasized by Marczyk and DeMatteo (2010), stating that philosophical assumptions influence research method, data collection techniques, data analysis approach, research outcomes and documentation of research results.

3.2.1 Justification for Research Design

Due to the scope and nature of this study, the explanatory process has been adopted as the most suitable for this research. This is because of the research aims to develop a capacity assessment framework that can enhance disaster preparedness and response capabilities within Kingdom of Saudi Arabia (KSA). To do this, global best practice is examined and critical success factors are derived from each best practice to develop a framework that can enhance disaster response in KSA.

Therefore, the body of knowledge that guides this research is best practice in disaster preparedness and response especially those beneficial to improving capability for disaster response. The research epistemology is based on this scope and that policy consists of critical success factors that make them work (Norris, 2005). In this sense, best practice and knowledge in disaster preparedness and response are presented as "knowledge that exist" and not "knowledge that needs to be created". Therefore, the philosophical belief of this research is that critical success factors exists and constitute to what is acceptable knowledge in this field of study.

Ontology which is concerned with nature of reality, motivates the researcher to examine and seek to understand how the world operates (Brown and Baker, 2007). In this research, ontology is concerned with nature of reality in terms of how critical success factors operate within a disaster management organisation that influences disaster preparedness and response. The research design is justified based on the difference between capabilities assessment, the reality and the perception of how effective capability assessment framework can enhance disaster response in KSA. While the research ontology is influenced by the literature review, the axiology influences the researcher to understand and recognise the role of values, opinions and perception in data collection process.

Therefore, the justification for the research design have been based on the research aim and the philosophical stances that provide guidance and structure for possible methods that can be used to conduct an explanatory research process. To do this, subsequent sections in this research focuses on examining each layer in the research onion and justifying the selection of philosophy, approach, strategies, choices, time and techniques that conforms with the research inquiry process.

3.3 RESEARCH PHILOSOPHY

Saunders *et al.* (2009) explained that research philosophy relates to the development and nature of knowledge in a given field of study. Philosophy as mentioned here refers to paradigms (Collis and Hussey, 2009), which according to Easterby-Smith *et al.* (2012) is vital in understanding the concept that govern a research area as well as acceptable thoughts and knowledge in the field. According to experts in research methodology such as Saunders et al. (2016), Easterby-Smith et al. (2004) and Collis and Hussey (2013), there are two main philosophies in the social sciences i.e. positivist and interpretivist. However, the understanding and choosing a philosophy is significant to planning and conducting a research (Morgan, 2007).

The positivistic philosophy is theory testing and encourage well understanding of phenomena, it has some alternative terms such as objectivist, and scientific paradigms which makes positivism quantitative in its process of inquiry and investigation, quantitatively measuring, and objectively predicting relationships between variables. The interpretivist philosophy on the other hand is associated with subjectivism and interpretive linking its inquiry process with qualitative research (Collis and Hussey, 2009). It focuses on the element of social constructions. These elements include the awareness, meaning, and language to understand the phenomenon of social research. Easterby-Smith et al. (2004) summarised the main differences between these two philosophies in Table 3.1.

Table 3-1: Differences between positivism and interpretivism (Easterby-Smith et al. 2004)

Features	Positivism	Interpretivism
The observer	Independent	Is part of what is being observed
Explanation	Must demonstrate causality	Aim to increase general understanding of the situation
Research process	Hypotheses and deductions	Gathering rich data from which ideas are induced
Concepts	Need to be operationalised so that they can be measured	Should incorporate stakeholder perspectives
Units of analysis	Often reduced to simplest forms	May include complex situations
Generalisation	Statistical probability	Theoretical abstraction

However, each of these philosophies is formed from philosophical assumptions that is often referred to as ontological, epistemological and axiological assumption (Saunders et al., 2016). In this regard, Marczyk and DeMatteo (2010) declared that philosophical assumptions influence research method, data collection techniques, data analysis approach, research outcomes and documentation of research results. Therefore, all research is based on certain underlying assumptions about what constitute knowledge which emphasizes the importance of establishing the epistemology of a study area (Kothari, 2008).

Descriptions of the philosophical assumptions that support these two main philosophies are provided in Table 3.2. Understanding philosophical stances, including epistemology, ontology and axiology is necessary. This is because establishing the relationship between the philosophical stances is important for validity and reliability of a research result and data collected (Marczyk and DeMatteo, 2010).

Table 3-2: Assumptions of the major philosophies (Collis and Hussey, 2013).

Philosophical assumption	**Positivism**	**Interpretivism**
Ontological assumption. The nature of reality (knowledge) being or how the world operates	Reality is objective, singular and separate from the research.	Reality is subjective and multiple, as seen by the participants.
Epistemological assumption How we accept knowledge (reality)	Researcher is independent of that being researched	Researcher interacts with that being researched
Axiological assumption the role of values	Research is value-free and unbiased	Research is value laden and biases are present

The ontological assumption, as shown in Table 3.2, is about the nature of reality (existence). It is a general set of assumptions about being or how the world operates and what is reality (Brown and Baker, 2007). Ontology, which is concerned with nature of reality motivates the researcher to examine and seek to understand how the world operates (Brown and Baker, 2007). In this research, ontology is concerned with nature of reality in terms of how critical success factors operate within a disaster management organisation that influences disaster preparedness and response. The research design is justified based on the difference between capabilities assessment, the reality and the perception of how effective capability assessment framework can enhance disaster response in KSA.

Ontology has two main aspects including objectivism and subjectivism. Objectivism, also referred to as positivism, clarifies and test theories and believe that reality is sure and can be observed and defined from an objective view. Also, there is a believe that there is only one reality, practiced by us all (Saunders et al., 2016). In contrast, subjectivism is most appropriate for use with interpretivism. It concentrates on the interaction between user, phenomenon and process, and it is used to understand situations, it is supposed that there are multiple realities (Collis and Hussey, 2013). However, the interpretivism research is typically used to collect full information to understand and interpret the social worlds. Consequently, this means considering the issue from different group of actors, to initiate and understand experience in specific settings (Saunders et al., 2016).

The epistemological assumption within a research is about the beliefs that we have about the nature of knowledge, and how we accept knowledge (reality) in the study area (Norris, 2005) and the relationship between the researcher and the known (Gray, 2014). In positivist approach, research facts act to restrain our beliefs. These assumptions are usually found in the arenas of social sciences studies, which are dealing with the actions and behaviour of people (Ibid). In the interpretivist approach, the researcher is a part of what is being researched (Collis and Hussey, 2013). Thus, interpretivists believe that reality can only be interpreted and beliefs what would determine as facts.

Consequently, and from epistemological perspective, this research is based on scope and the policy consists of critical success factors. In this sense, best practice and knowledge in disaster preparedness and response are presented as "knowledge that exist" and not "knowledge that needs to be created". Therefore, the philosophical belief of this research is that critical success factors exists and constitute what is acceptable knowledge in this field of study. This research attempts to investigate development of a consistent capacity assessment approach to enhance disaster preparedness and response capabilities within Kingdom of Saudi Arabia.

An axiology assumption is about the role of values (Collis and Hussey, 2013). From an Objectivism (positivism) perspective, the research is value-free and unbiased; because the researchers are considering that they are independent from what they are researching (Ibid). From a Subjectivism (interpretivist) perspective, the research is value laden, which means that the researchers are involved with what is being researched and biases are present (Ibid). Therefore, from the axiological views the researcher believes that personal interaction with such people concerned about disaster management sector via interviewing them is essential methods to explore what assessment methods or frameworks exist in Saudi Arabia for determining disaster response capacity.

As a result, this research will be value laden, as this research deals with subjective matters to understand the phenomena. The justification for the research design have been based on the research aim and the philosophical stances that provide guidance and structure for possible methods that can be used to conduct an explanatory research process. To do this, subsequent sections in this research

focuses on examining each layer in the research onion and justifying the selection of philosophy, approach, strategies, choices, time and techniques that conforms with the research inquiry process. The research design is also influenced by research problems which had been identified by the research during work experience in the field of emergency/disaster management in the KSA.

Punch (2005) emphasized that in addition to identifying research problems, research design also deals with four main questions; what strategy to use; the conceptual framework; who or what will be studied; and what tools and procedures are to be used for collecting and analysing (Punch, 2005). The initial stimulus for this research and a research design modeled after the four main questions emphasized by Punch (2005) have influenced the overall research process, which is discussed later in this chapter. Based on the above, the researcher adopts interpretivism philosophy for this research. This is because the concept of the study incorporates critical success factors, best practice from a global context and methods used in enhancing disaster preparedness and response capacity, all of which is more interpretivist in ontological stance with value bound axiology.

Furthermore, the data collection process peculiar to the two philosophies also influenced the choice of interpretivism. As explained by Bryman and Bell (2011), while positivism mostly utilises artificial location, interpretivism has preference for natural locations. Since the data collection process and location are important to the research testing, and impact the validity and reliability of research results (Saunders et al. 2012), the interpretivist philosophy is considered more suitable for this research area. Although, the interpretivist is low in validity, it can be enhanced by using mixed methods (Fowler, 2009). Being aware of the limitation of interpretivism in terms of validity of results, the researcher has also chosen the positivism philosophy in terms of questionnaire survey with 10 officials and experts from Ministry of Interiore and 11 from Civil Defence to enhance validity and reliability of the research. In practice, it is often better to use the multiple methods to address different research questions and to adapt triangulation, as well as to balance out any weaknesses in data collection method (Gray, 2014).

3.4 RESEARCH APPROACH

Approach is the second layer in the research onion. It is the process that a researcher may adopt for understanding and investigating the observation or research hypothesis (Saunders et al. 2016). The research approach can be two ways as indicated in the research onion i.e. it can either be deductive or inductive. The deductive approach is the process which starts with the theory development relating to the assumptions that motivated a study and the process progresses to testing the hypothesis for which the study is based and leading to the outcome, in which either the hypothesis is rejected or accepted (Gilner, et al. 2009).

The deductive process shows that the research outcome can have either two outcomes. While this seems rather direct enough for studying specific themes or topics, it limits the contribution to knowledge (Hesse-Biber, 2011). Inductive research, on the hand, starts with the observation of a phenomena, which subsequently leads to the development of theory or theories (Saunders et al. 2012). In this instance, the process that leads to theory development in inductive research ensures that patterns and themes are identified and possible relationships between themes and data are established where possible (Hesse-Biber, 2011). While this process is known to be rigorous, inductive approach is able to contribute to known due to these characteristics (Kothari, 2008). The inductive approach starts with direct observation of specific instances and seeks to establish generalisations about the phenomenon under investigation. Meanwhile the deductive approach is a theory testing process that commences with an established theory or generalisation and seeks to establish by observation whether it applies to specific instances.

Collis and Hussey (2009) argue that discussion of different types of research philosophies and approaches allows the researcher to understand the best way to conduct research. This process ensures that validity and reliability of data collected and analysed remains a focus for the researcher and throughout the data collection process. While it is characteristics of phenomenology philosophy to follow the inductive process (Saunders et al. 2009), it is also evident from the features of inductive approach that it is more aligned towards this study scope. Table 3.3 shows the differences between the two approaches.

Table 3-3: Differences between inductive and deductive approaches (Saunders et al. 2016)

Deductive approach	Inductive approach
Scientific principles are used more often to explain and test hypothesis	Understanding of phenomenon follows a flexible process
Constant and variable factors need to be determined	Identifies themes and patterns and establishes relationship between them
The application of controls to ensure validity of data	A more flexible structure to allow discovery of new findings
A highly controlled and restricted format for data collection	More engaging and interactive approach to data collection
Researcher independence of what is being researched	Researcher facilitates the research process
Common with natural sciences	Common with social sciences

The research philosophy selected for this research study is inductive, given that the research seeks to build theory from the perceptions of officials and experts from Ministry of Interior and Civil Defence, about preparedness and response capabilities within Kingdom of Saudi Arabia. Thus, inductive approaches are seen to be more aligned to the needs of this research. Inductive approaches allow for theory building process based on the perception and interpretation of human beings towards the social world (Saunder et al., 2012).

However, as mentioned in previous section, this research also involved use of quantitative approaches in order to validate the results and provide stronger conclusions. As highlighted by Martin and Cepeda (2005), there is no theory-free research and that all empirical study is created on some fundamental thoughts (Martin and Cepeda, 2005). Likewise, Saunders et al. (2016) advocate that a combination of deduction and induction approaches is not only perfectly possible in the same research, but is often a valuable approach. Such an approach is often referred to as an Abductive approach. Thus, the researcher has preferred to combine the deductive and inductive approaches, where some critical success factors, required to investigate the capacity assessment framework that enhance disaster preparedness and response capabilities within Kingdom of Saudi Arabia will be

derived from the literature and then investigated in the empirical study (deductive approach). Then, the findings from the empirical work will be incorporated into the existing theory (inductive approach).

3.5 RESEARCH METHODOLOGICAL CHOICES

The research methodological choice is the fourth layer within Saunder's (2016) onion model, adopted for conducting this research study. According to Saunders et al. (2012), more than one choice maybe used for to design and collect data. As seen in the research onion, there are four possible choices which can be used, namely; a mono method (quantitative or qualitative method), multi method quantitative, multi method qualitative, and mixed methods. A brief description of each of these is presented below.

Quantitative research methods as described by Naoum (2013) are objective in nature, based on testing a hypothesis or a theory composed of variables, measured with numbers, and analysed with statistical procedures. It usually requires a large database to achieve more accurate findings. Survey techniques is considered a quantitative research method approach that have a tendency to answer who, what, where, how much and how many questions. Typically, it is linked to the deductive approach.

Qualitative research method is often applied to a smaller sample size due to issues of time and cost however, valuable conclusions can still be drawn due to the deep and insightful information. Qualitative research is 'subjective' in nature. It emphasizes meanings, experiences (often verbally described), description and so on (Naoum, 2013). Qualitative research method are conducted in many ways such as interview, observation, and case study. Table 3.4 illustrates key differences between qualitative and quantitative approaches.

Mixed Methods is in response to the limitations of the two traditional methods i.e. quantitative and qualitative methods. The development of mixed methods, as a third methodological choice, in the social and behavioural sciences, began during the 1980s (Tashakkori and Teddlie, 2003). Mixed method is the combination between the quantitative and qualitative methods within the same research, in order to allow for collection of more data in different aspects of a study (Giddings and

Grant, 2006). Mixing of quantitative and qualitative data increases the strengths and reduces the weaknesses of each type, as well as bridge the gap between these two approaches (Creswell et al., 2011).

However, this combination lets the researcher to use both interviews and questionnaire techniques (Gray, 2014). Likewise, Yin (2009) argues that in order to increase the validity of the research, it is useful to use both the quantitative and qualitative methods in the same research. In addition, Creswell (2003) believed that the researcher can use the qualitative and quantitative methods in data collection separately, without any actual order. Table 3.4 presents a comparison between qualitative and quantitative approaches.

Table 3-4: Comparison of qualitative and quantitative approaches (Creswell et al. 2011)

	Quantitative	**Qualitative**
Role	Fact- finding based on evidence or records	Attitude measurement based on opinions, views and perceptions measurement
Relationship between researcher and subject	Distant	Close
Scope of findings	Nomothetic	Idiographic
Relationship between theory/concepts and research	Testing/confirmation	Emergent/development
Nature of data	Hard and reliable	Rich and deep

According to the above discussion, this research adapted concurrent mixed methods. The decision to use mixed methods is made in order to address the limitations of each method and enable the gaps of a method to be filled by the strengths of the other (Saunders et al. 2016). Consequently, this research used qualitative data collection approaches to allow for semi-structured interviews with key experts within Civil Defence and the Ministry of Interior (KSA). The data was analysed using the Nvivo data analysis software. Also, quantitative data collection approaches were used to undertake a survey of 21 officials and experts from MOI and Civil Defence. Data collected from survey study was analysed using Microsoft Excel software. A multi-method approach provided both data and method triangulation, and maximized the validity and reliability of the research in each stage.

However, the importance of data collection techniques is usually determined through the selection of research strategies. Thus, next section discusses key research strategies.

3.6 RESEARCH STRATEGIES

There are different strategies that can be used for conducting a research of this nature. Saunders et al. (2016) have identified different types in the research onion as seen in Figure 3.1. However, strategies must be selected and justified in relation to availability of data that relates to the research aim (Kothari, 2008). Thus, this section examines the strategy and choices adopted for conducting this research and the reasons for selecting them. It also examines other available options that could have been used and the reasons for not using them are explained. Saunders et al. (2016) identified archival, survey, case study, experiment, and action research as potential strategies that can be used for conducting a research process. However, Yin (2009) argued that strategies commonly used in researches similar in scope to this one are survey, case study and documentation.

All these strategies may be selected based on the type of research questions that need to be answered, and the level and extent of control the investigator possess over the study (Teddlie and Tashabbori, 2009) and the focus on issues and events in life (Flick, 2011). Table 3.5 shows the difference between some commonly used strategies and the form of research questions that seek to answer, which influences the decision to use them.

Table 3-5: Research Strategies Characteristic Adopted from White (2009) and Saunders et al. (2016)

Strategy	Form of Research Question	Requires control of Behavioural Events?	Focus on Contemporary Events
Experiment	How, Why?	Yes	Yes
Survey	Who, What, Where, How many, How much?	No	Yes
Documentation	Who, What, Where, How?	No	Yes/No
History	How, Why?	No	No
Case study	How, Why	No	Yes

As seen in Table 3.5, form of research questions which can be answered using experiment differ from survey, documentation, historical analysis and case study. While these differences indicate the

strength and limitations of the strategies, it also indicates that no strategy is perfect, but decisions to use one strategy over another is based on research questions that need to be answered (White, 2009). For example, the experiment strategy uses small sample or portion in a controlled area to determine the whether a hypothesis should be accepted or not (Marczyk and DeMatteo, 2010). The environment is controlled in order to retain the validity of the data (Bryman and Bell, 2007), however, Marshall and Rossman (2006) argued that this strategy limits the scope of the research to fixed factors within the experiments. As such, the type of questions that be answered using this strategy is limited to "How" and "Why".

Survey on the other hand is an inquiry process which engages with people in an uncontrolled setting (Fowler, 2009). Determining participants for a study using this strategy may be challenging (Bryman and Bell, 2007), but it is often done with the aid of a sampling method in order to get an objective reflection the phenomenon being studied (Kothari, 2008). The survey which may be in form a questionnaire or one that involves more in-depth interaction like interviews is considered one of the most widely used strategy for sourcing information that can help to answer a wide range of questions (Saunders et al. 2012). While survey may seem like the most comprehensive strategy to use for an inquiry, documentation also presents the avenue to explore and seek answers to a wide range of question forms (Fowler, 2009). However, its limitations are that issues already documented may have been outdated or limited in scope to the study area (Gilner et al. 2009).

Regardless of this limitation about documentation, survey is still known as one of the widely-used strategies for establishing context and background, identifying gaps in existing or previous study on a topic and building knowledge in a research area (Hesse-Biber, 2011). For example, the information or data for the extended literature review conducted in this research have been sourced from documented materials. Similar to this, the use of historical or archival strategies are considered as viable sources of data. However, this strategy is limited in terms of questions that can be answered and mostly focused on past issues, which might be related, but not accurate enough on contemporary issues (Marshall and Rossman, 2006).

Nonetheless, historical analysis is considered appropriate for answering research questions that relates to "how" and "why" which is similar to case study strategy. Case study strategy is an "empirical process for investigating a phenomenon within a real-life context, especially when the

boundaries between phenomenon and context are not evident" (Yin, 2009:13). Case study like most of these strategies briefly examined have their strengths and limitations which influences the decisions to use any one of them for a research inquiry process.

However, a case study strategy is recommended if the researcher needs to achieve a rich understanding of the context of the research (Saunders et al., 2016). Yin (2014) highlighted that the advantage of case study strategy is the use of various sources of methods such as a combination of qualitative and quantitative approaches in the research. Moreover, the vital use of a case study methodology is when a researcher wants to explore the situation being evaluated, which has no clear results. Fundamentally, case studies can be highly advantageous for understanding multifaceted phenomena, developing rich descriptions and maintaining what Yin (2014) notes as the holistic and meaningful aspects of real events and situations. Direct access to key individuals in the case organisation studies can generate deeper contextual perspectives and interpretations from those actors engaged in the research area.

Byrne and Ragin (2009) note the strength of case studies for management and organisational research and assert that the principal units of analysis in this approach are frequently organisations and relationships. For both the conceptualization and the validation phases, the case-based approach further has the advantage of being capable to develop strong internal validity through in-depth description of multiple factors allowing for triangulation of data through the use of multiple sources (Yin, 2013). This research is mainly exploratory, consequently, this research attempts to have understanding and to explore key building blocks of capacity assessment framework to enhance disaster preparedness and response capabilities within Kingdom of Saudi Arabia. For this reason, the case study strategy is considered to be an appropriate strategy for this research, in order to gain the depth of understanding of the information necessary to explore the capacity assessment to enhance disaster preparedness and response capabilities.

3.6.1 Types and Designs of Case study

Case study can be conducted in one organisation (single case) or in a more than one organisation (multiple cases). However, whether it was multiple or single, the case study can be embedded case or holistic case, conditional on the defined unit of analysis (Yin, 2014). Incidentally, Voss et al.,

(2002) supported that fewer cases are best opportunity for in-depth investigation. Figure 3.2 explains these types and designs of case study.

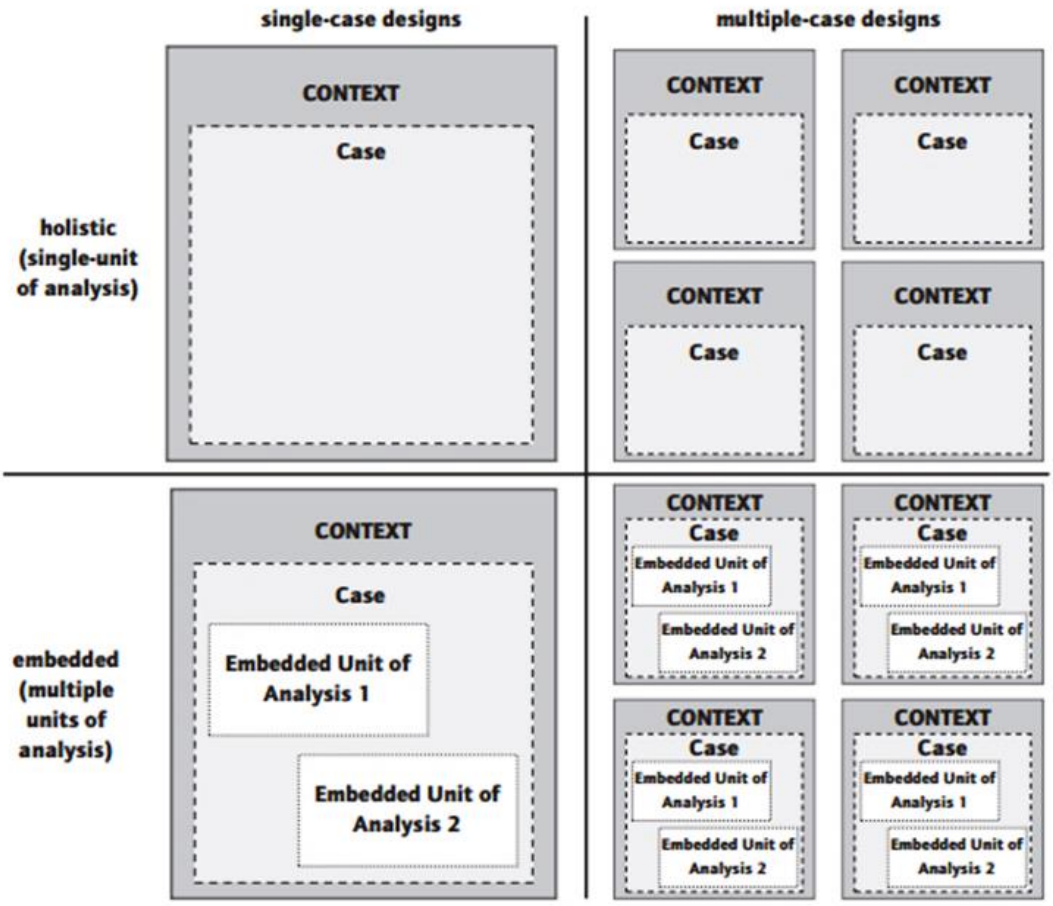

Figure 3-2: Types and designs of case study (Yin, 2014)

According to Yin (2014), a single case can be adopted as strategy if the case considers: a) an extreme or unique case; b) a representative or typical case; c) a revelatory case and d) in case of longitudinal studies, when studying the same single case at two or more different points in time. However, Yin (2014) further suggested that the multiple case studies are usually adopted to replicate results and support generalizations, as well as to increase the validity of the research. Consequently, multiple case studies are considered an appropriate strategy for this research, based on following reasons:

- The main aim of this research is to develop a capacity assessment framework to enhance disaster preparedness and response capabilities from the point of view of the officials and

experts from MOI and Civil Defense in the Kingdom of Saudi Arabia. Key challenge here is not to prove or disprove a hypothesis, rather to establish basic building blocs of a disaster capability maturity system and to obtain insights from concerned stakeholders;

- The disaster preparedness and response capabilities involve: the MOI and the Civil Defense. Given confidential and sensitive nature of security related work, doing a wide scale survey is not a possibility. Case study was considered most appropriate method to elicit implicit and explicit data from research participants.
- Case study choice was considered appropriate to address key research questions.

Thus, the researcher adopted multiple embedded case studies strategy, with detailed analysis of the ministry of the MOI and the Civil Defense, within Riyadh and Jeddah regions.

3.6.2 Rationale for Case Study Selection

Within KSA, General Directorate of Civil Defence (GDCD, 2016) is responsible for Disaster/Emergency response capacity development across the country. GDCD comprises Ministry of Interior (MOI) and the Civil Defence. Government offices in two key regions of Riyadh and Jeddah were selected as case studies, primarily because of their major urban location and strategic roles these regions have played previously in managing disasters within KSA. Also, selection of case studies in two different cities allow for replication and comparison in order to support generalisations, as well as to validate whether the suggested framework can be practically applied to enhance disaster preparedness and response capabilities within KSA. In recent years, Riyadh and Jeddah regions have seen increase in various man-made and natural disasters including earthquake and landslide, rains and floods and sand storms, thus, they need to increase response capacity for dealing with these disasters. Both cities have seen remarkable growth in recent years in terms of urban infrastructure development and population growth. This rapid growth also increases risk exposure. The Ministry of Interior (MOI) and Civil Defence has the ultimate responsibility of handling disasters, protecting lives, property and ensuring security. Yin (2014) developed a protocol for case study conduct emphasizing field procedures. He proposed seven major sources of data collection that could be used in the case study strategy. These methods of data collection are listed in Table 3.6 and compared in terms of their strengths and limitations.

Table 3-6: Strengths and limitations of seven sources of data collection (Yin, 2014)

Source of evidence/strategy	Strengths	Limitations
Documentation	▪ Stable: Can be reviewed repeatedly ▪ Exact: contains exact names, references and details	▪ Biased selectivity, if collection is incomplete ▪ Access may be restricted
Archival Records	▪ Same as above ▪ Precise and insightful	▪ Same as above ▪ accessibility may be limited for confidentiality
Interviews	▪ Focus on interviewees ▪ Insightful: provides perceived causal inferences	▪ Response bias may occur due to personal interests of interviewer/interviewee ▪ Irrelevant data may be collected
Direct observation	▪ Covers events in real time ▪ Covers context of event	▪ Time consuming ▪ Events may be processed differently
Focus Group	▪ Focused on research participants ▪ provides in-depth explanations of situation	▪ too much irrelevant data may be provided ▪ researcher can be influenced by the sentiments of research participants
Participation / direct observation	▪ Same as for direct observation ▪ Insightful into interpersonal behaviour and motives	▪ Same as for direct observation ▪ Bias due to investigator's involvement in events
Physical Artefacts	▪ Insightful into cultural features ▪ Insightful into technical operations	▪ Selectivity ▪ Lack of Availability

In addition to the cases study, this research also employed survey strategy. Since this research is exploratory and explanatory research, with a focus on answering "why", "how", "who", "where", "what" questions, thus, the survey strategy was considered appropriate. Use of this strategy was to identify, review, and assess different best practice and capability assessment methods in order to identify critical success factors for the framework, aimed to be developed for KSA. This influenced the decision to use the survey for conducting this research in addition to semi-structured interview.

3.7 TIME HORIZON

Levy and Lemeshow (2008) states that another factor that play a significant role in influencing the quality of data collected is time frame for conducting a research. Saunders et al. (2012) referred to this as time horizon. Time horizon can be a cross-sectional, which is short-term investigation process or longitudinal, which is conducted over a long period of time focusing on specific samples (Saunders et al. 2012). Time is a major player in research investigation and can significantly influence the successful completion of a research (Levy and Lemeshow, 2008). This understanding influences researchers to develop project plan to enable them to monitor research tasks and activities (Saunders et al. 2009). Based on this understanding, the cross-sectional time horizon was considered more appropriate, given the research scope, questions and inquiry process. The decision to use cross-sectional time horizon also aligns with what needs to be achieved in this study and the available resources for conducting the research.

3.8 DATA COLLECTION AND ANALYSIS

There are numerous methods to draw out information from people, such as interviews, observations, questionnaires, interviews, observations or archival material (Collis and Hussey, 2013). Considering the fact that no one methods fits all researches, the research philosophy, research approach, research strategy and aim of research will generally direct the suitable method to use (Yin, 2014). The key methods adopted in data collection included: literature review, semi-structured interviews and survey. This section explains the data collection methods and rationale for their adoption in each stage. However, Collis and Hussey (2013) affirm that, there are two main types of data collection; secondary data and primary data. Primary data is data that is collected precisely for the purpose of this research. While, secondary data is data collected for a different purpose, but related to the topic of the research, and which the researcher has collected to build the theoretical base for this study.

3.8.1. Literature Review as Secondary Data

According to Levis and Ellis, (2006) literature review in this research was serving various objectives including:

- To develop an understanding of the current body of knowledge in the area of disaster resilience and helping researcher understand "what is already known?" and "what is needed to be known?"
- To provide a solid theoretical foundation for the proposed study;
- To verify of the presence of the research gap and problem;
- To validation of the fact that proposed study contributes to knowledge;
- To frame the research methodology, research approach, and research goals and questions

A review of the literature on existing approaches to capacity assessment was undertaken, in addition to a review of related literature. Relevant sources were drawn from an extensive time span, ranging from 1987 to 2015. This was perceived as critical for this study given the acknowledged importance of learning lessons from previous disaster experiences (Turoff, 2002; Danielson and Ohlsson, 1999). The sources are principally drawn from four key categories of books, peer-reviewed journal articles, government reports and publications from supranational organisations.

The predominant source is journal articles providing empirical knowledge and analysis, originating from a range of disciplines covered by the journals reflecting the multi-disciplinary nature of the subject. These include: *Australian Journal of Emergency Management, Disaster Recovery Journal, and The Journal of the American Society of Professional Emergency Planners, China Journal of Safety Science and Technology, Safety and Environmental Engineering, Engineering Construction and Architectural Management, Safety Science, International Journal of Physical Distribution and Logistics Management, The Academic of Management Review, Strategy and Leadership* and *Communications of the ACM.*

The researcher used library search, electronic magazines and academic journals, and internet to develop the literature review. Also, this literature review used books, conference proceedings, and different reports and related documents. Literatures also include training material from Ministry of Interior in KSA and published literature.

In this study both primary and secondary data were used in order to attain a comprehensive view of the subject and fully understand the matter. The most methods used to collect primary data were

semi-structure interviews; focus groups; questionnaires; observation and documentation as the main technique to gather in-depth knowledge from the case studies. In this regard, Yin, (2009) listed five sources of evidence for data collection in the case study: documentation; archival records; interviews; observation; and physical artefacts. All sources might be complementary and could be used in cycles. Thus, a case study should use many sources, on condition that they are relevant to the study (Yin, 2014).

3.8.2. The Interviews

To conduct a case study, the researcher has to find sources of evidence as defined by Yin (2014). Therefore, this research used multiple sources of evidence coming from five sources of evidence as mentioned in the previous section. The interviews are one of the methods that could help a researcher to collect reliable and valid data. According to Saunders et al. (2009) interviews can be classified into three types:

- Structured interviews
- Semi-structured interviews
- Unstructured interviews.

Oppenheim (2005) describing structured interviews as an 'interview schedule', where the same phrasing and instruction of questions are used, moreover using this type of interviews could contribute to obtaining uniform data, which guarantees the comparability of data collected. In contrast, in unstructured interviews the questions are expressed unexpectedly throughout the interview (Sekaran, 2003). In this situation, the interviewer requests a clear idea about the facets that are wanted to be discovered, as there are no exact questions to work over (Saunders et al., 2016). Moreover, in this style of interview the interviewee feels free to talk about their point of view, opinions, and attitudes related to the area of the study.

Regardless of the possible fluency that both unstructured and structured interviews offer as research methods, the semi-structured interview includes various advantages over both techniques (Yates, 2004). For instance, a flexibility in giving in-depth information; large choice given to the interviewer and providing uniform information similar through the structured interviews without missing the choice met with unstructured interviews (Oppenheim, 2005). Accordingly, a semi-structured face-

to-face interview was selected in this study as it is a prevailing data collection technique (Collis and Hussey, 2013; Sekaran, 2003).

3.8.2.1 Interview Sample

The semi-structured face-to-face interview method is employed for this research to gather in-depth qualitative data. By using this technique, it is possible to elicit and explore the experiences, knowledge and perceptions of key actors in relation to Saudi disaster management. For this research, the most dependable data came from people concerned and are informed about disaster managing issues in the case studies. Based on the need and specific area in which this research focus on, the stratified sampling method is used to select and partition the population (Collis and Hussey, 2013) of those who work in the emergency sector in KSA into groups based on their ability to answer questions on the research related area and their years of experience in the field.

As expected of stratified sampling method, the group of participants for both the interview and focus group are selected through stratified means because of the tendency of their answers, information and data provided to influence the research themes and variables being measures/assessed. Therefore, a total of eight experts and leaders within the field of KSA disaster management were selected; 5 experts from Civil Defence and 3 experts from the Interior Ministry. Figure 3.3 illustrates the flow of relationship between the sample population and the interviewees.

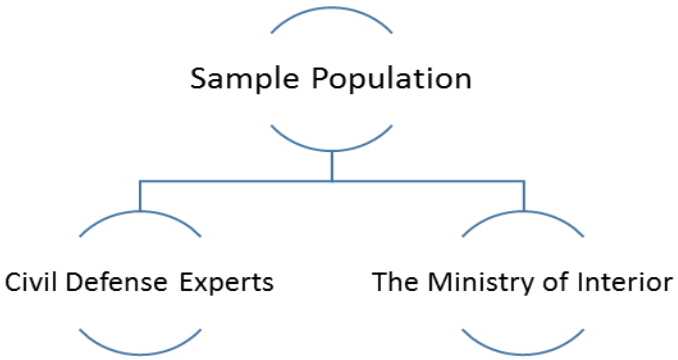

Figure 3-3: Sample population

As seen in Figure 3.3, two main organisations were the case studies examined. The experts from these organisations were interviewed on questions derived from the research objectives and gaps identified from the literature review. Their proficiency and years of experience were imposed them

to planning and response permanently to disasters as well as they aware about the negatives and positives in disasters in Saudi Arabia. (*A copy of the interview questions can be found in the appendix C*).

3.8.3. Focus Groups

Focus group is common technique for collecting qualitative data. It can be used in combination with other research methods or an independent method. This technique was used as a data collection in research in the 1920s. A focus group is discussion among a small group to obtain opinions in a well-defined area of interest (Campbell, 2008). The number of participants is not fixed, for instance, Campbell (2008) thought that focus groups usually ranging from 4-12 persons depending on the subject and arrangement. Likewise, Powell and Single (1996) believed that the number of participants can be between 6 and 10and depends on the subject. Jankowicz (2000) explained that the focus groups will be beneficial if the researcher:

- as a triangulation with other data collection methods to ensure validation
- exploration of initial concept
- Evaluate services or testing ideas
- Understanding of opinion, believes and attitudes
- Understanding about a particular topic
- Identifying gaps between different groups
- Encouraging discussion about a certain topic;

According to the all of these points, the focus groups were adopted as one of the four elements employed in the review stage.

3.8.3.1 Recruiting Participants for Focus Group Discussion

This study utilises a sample of experts to access the specific knowledge and expertise they possess in their respective fields. Experts can provide a unique and informed view drawing on their involvement at the core of the generation and implementation of strategies, solutions and policies; they have privileged access to information on key actors and stakeholders and decision-making processes. Ten experts were chosen precisely, these experts had worked at least 15 years in the

disasters and crises as leaders in civil defence or Interior Ministry. These experts discussed to explore their views and attitudes on 15 various criteria or factors that contribute towards effective disaster management which was presented in chapter two (Table 2.6). During this session, the experts were asked to validate the potential disaster preparedness and response capacity assessment framework. The outcome of this session constitutes the result assessed and discussed in chapter six and seven respectively. Before discussion the researcher gives the experts an idea about the search and explains the meaning of the factors affecting disaster response. The most important factors were chosen through experts and accordingly a framework been made.

3.8.4 Survey Questionnaires

Quantitative data had been collected using survey questionnaires. Questionnaires are set of predetermined questions to be answered by each respondent when asked, they are considered to be techniques for data collection (deVaus, 2002). Questionnaires are the most effective techniques in collecting responses from a large population using the same questions set within the survey strategy (Robson, 2002). In the initial stages of research, author did consider using a survey questionnaire approach, however, its use was not considered feasible because of confidential nature of security related to matters related to Ministry of Interior. Also, survey would not provide deeper insights into matters related to organisational working.

3.8.5 Questionnaire construction and interview questions development

As explained earlier in this section, both questionnaire and interview play important roles in the data collection process. However, this would not have been possible without a well-structured questionnaire and interview questions well developed. The questionnaire construction followed the recommendations by Hesse-Biber (2011) for constructing a good questionnaire. According to Hesse-Biber (2011) the design of a questionnaire is influenced by the research questions and the need to collect quality information for better understanding of a phenomenon and/or to test specific hypothesis that may have been previously generated. In this case, the CSFs needed to be identified and ranked by experts in KSA to determine the applicable CSFs in KSA context and their importance in developing capacity for disaster response.

Based on this need, the questionnaire was constructed as a standardised format with close ended questions that focused one of the objectives which needed to be tested. The questionnaire design

made it easy for respondents to give necessary and relevant information that encouraged the process of recording and analysing the answers provided (Saunders et al. 2016). The clue for questions in the questionnaire were derived from the key findings in the literature review and the research objectives. Regardless, and as explained by Gill and Johnson (2010) questionnaire design need to follow certain steps, in which the researcher determined the information required from the gaps, literature review and research objectives.

Defining the target respondents also helped in determining the type of words to use and the question content, as well as how to frame the questions and length of questionnaire (Hesse-Biber, 2011). This process informed the questionnaire construction. Similarly, the interview question development followed this pattern. Questions were derived from the literature review gaps, research objectives which needed in-depth explanations and understanding. Unlike the questionnaire which only focused on one research question, the interview questions development cut-across all gaps identified in the literature review and all objectives, leading to the process of generating more comprehensive data that can be triangulated (Given, 2008).

3.9 SUMMARY OF RESEARCH STAGES

This research is focusing on the development of a framework, which can be adopted to enhance engagement of community in early response, in order to mitigate the impact and risk of natural disasters in the KSA. This section explains and rationalizes the four key research stages described in Figure 3.4. These steps are consistent with Systems Engineering Process (Adcock, 2009). Relationship between key research phases is not linear; rather there are feedback and iterative links to previous research phases.

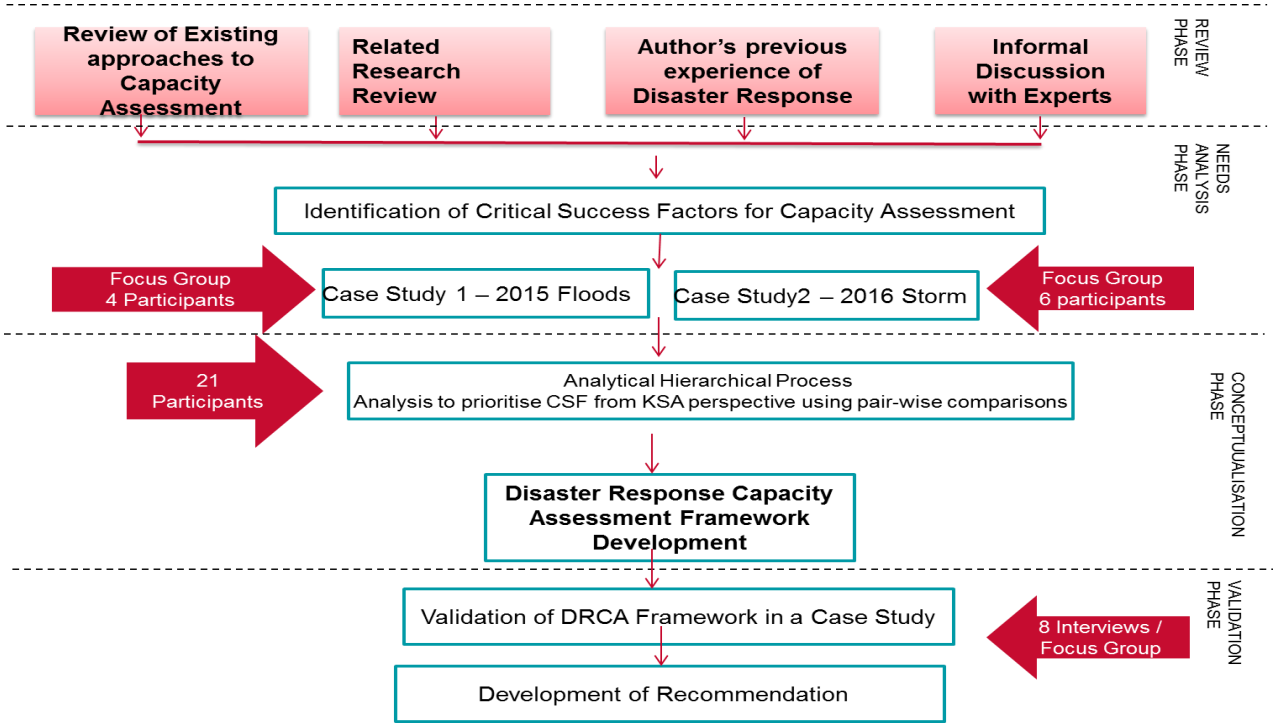

Figure 3-4: Research stages and procedures

It can be noticed that the research design has helped the researcher to divide the research process into stages for good data management. The procedure and stages illustrated in Figure 3.4 also show specific phases that enabled the researcher to identify relevant information to this research and how the literature review has informed the research questions.

3.9.1 Research Review Phase

The review phase represents the initial phase of a four-stage research design illustrated in Figure 3.2. The aim of this stage is to develop an understanding of theoretical and practical approaches to disaster capacity assessment and to develop a good understanding of existing practice within the Ministry of the Interior, KSA. This stage draws on four sources of data:

- A review of existing approaches to capacity assessment;
- A review of related research;
- Researchers' previous knowledge and experience;
- Expert discussion.

It goes through reviewing the available literature about the Response Capabilities of Disaster Resilience in the KSA and the available International Best Practices in the world. Key concepts and potential problems in existing practice as highlighted in the literature. The key concepts and principles have been central to the framework proposed for Disaster Response, in an effective way to enhance stakeholders Response Capabilities and Community Disaster Resilience in KSA.

3.9.2 Needs Analysis Phase

The data gathered in the previous review stage formed the basis for the identification of critical success factors for capacity assessment. Two case studies of response to disaster events in recent years were reviewed. In order to reflect on effectiveness of disaster response efforts within respective case studies, a focus group was conducted with Civil Defense Officials (4 Officials in case study 1; 6 officials in case study 2) who were involved in disaster response effort. Focus group allowed for reflection on effectiveness of response effort in a guided discussion, which was monitored and recorded by researcher. Use of focus groups is popular both within private (Kitzinger, 1994; Morgan, 1998) and public sector e.g. used focus groups for assessment of public health education efforts (e.g. Bloor et al., 2001).

Focus groups were used to generate information on collective views of those who first hand participated in disaster response and meanings that lie behind those views. It was useful in developing a rich understanding of participants' experiences (Kitzinger, 1994). The data from the literature and from the expert contributions by key actors contributes an understanding of the policy and institutional environment at the national level, as well as identifying past and existing capacity

development programs. In the Needs Analysis phase, expert interviews were used to develop an understanding of the need for capacity assessment in the Saudi Context and to identify 15 critical success factors. This process reflects the initial stages of conceptualising the model, which involves mapping the chosen data sources to establish a scope of concepts (Jabareen, 2009) that can be reviewed and screened. The second element of this stage involves the use of a multi-criteria decision theory to identify and prioritise 5 critical success factors for developing a disaster capacity assessment framework.

3.9.3 Conceptualisation Phase

The literature review provides the theoretical foundation for the development of a competency based framework. The Conceptualisation Phase draws on the input from prior stages, to develop a Disaster Management Capacity Assessment framework, which will then be subject to a validation process in the subsequent phase. The conceptualisation phase draws on 3 key research methods: expert interviews, focus groups and questionnaires. Details are set out in Section 5.3. At this stage, the data is examined to determine critical success factors and key elements, as well as processes and mechanisms that represent an effective disaster capacity assessment framework. This is achieved through an iterative process during the expert interviews, focus groups and case study, drawing on the perspectives of key actors and case data. The conceptualisation of the framework involves drawing on the in-depth research and critique of the prominent and emerging literature in the area of disaster response capacity assessment. The triangulation of the methods and data provided contribute to the development of a conceptual framework. The specific process of framework conceptualization at this stage is based on the key steps identified by Jabareen (2009, p53-55). This involves:

- Review, identification and naming of the key concepts;
- Deconstruction and categorisation of concepts;
- Integration of concepts into a manageable set of concepts;
- Synthesis and re-synthesis.

3.9.4 Validation Phase

The final stage of the research process is concerned with validating the conceptualisation. The aim is to determine whether the model is comprehensible and accurate. Detailed process followed in explained in Section 6.2. The usefulness of the proposed framework can be evaluated in terms of

whether it presents a reasonable theoretical proposition for external parties. Validation draws on input from concerned stakeholders to ascertain the usefulness of the approach and its usability in a research context. This is a dynamic process whereby discussion and feedback provide opportunity to refine and develop the model. This validation process occurs during expert interviews, questionnaire and case study interviews. The model is continually revised drawing on new insights, reflections and comments to arrive at a model that is perceived as reasonable to achieve the research goal. As a result of following these phases, the research objectives were achievable in stages using different data collection techniques. Table 3.7 shows the research objectives and data techniques for achieving them.

Table 3-7: Stages and data techniques for achieving research objectives

Research Objective	Stages	Data techniques
To critically examine global best practice in capacity assessment and methodologies for disaster management	Stage 1	Secondary data – literature review
To identify and evaluate existing capacity assessment methods and approaches used for disaster preparedness and response in Saudi Arabia	Stage 2	Secondary data – Literature review Primary data – semi-structure interview
To analyse the impacts of challenges and identification of Critical Success Factors in capacity assessment of disaster response readiness	Stage 2	Secondary data – Literature review Primary data – Questionnaire
To develop framework for assessing disaster preparedness and response capability in Saudi Arabia	Stage 3	Primary data – triangulation of data from stages 1 to 2
To validate and assess the disaster preparedness and response capacity assessment framework	Stage 3	Primary data – semi-structured interview & focus group discussion
To develop recommendations that can guide and influence the development of monitoring and evaluation culture amongst Saudi national government, local Civil Defence organisations and the Saudi ministry of Interior	Stage 4	Triangulation of all secondary and primary data from stages 1 – 3.

As noticed in Table 3.7, the data collection techniques were carefully selected in relation to their relevance to the objectives, gaps identified in literature and the necessary inquiry that can lead to the development of recommendations that can aid the process for capacity assessment and development in KSA. Section 3.9.5 explains how the researcher's knowledge and experience influenced the data collection process so that reliability and validity can be retained in the research inquiry process.

3.9.5 Researcher's Knowledge and Experience

The initial review stage drew significantly on the researcher's own knowledge and experiences. The researcher views his extensive experience and knowledge in the field of disaster response management as vital in guiding and influencing the review and understanding of needs. This is consistent with a phenomenology axiological position that views the engagement of the researcher in the research process as critical. In qualitative methods, the researcher can assume a key role in comprehending and learning concerning the research topic (Given, 2008). Under this view, it is suggested that the researcher is the only appropriate instrument (Lave and Kvale, 1995, p.220). The knowledge and experience that can be applied by the researcher in this project can provide critical moderation and guidance by engaging with the different research subjects within the study.

However; this research had been initiated based on personal interest, observation and experience in emergency/disaster sector which provided opportunity to identify problems and gaps directly in the practice of emergency management. While this approach was not discussed by Gill and Johnson (2010), Palliyaguru (2010) explained that research topics can be formed through interest in the subject area based on several reasons. Thus, the combination of phases and researcher's knowledge and experience has ensured that data are well managed at every phase until data analysis is required. The next section presents the detailed procedure for using all methods and the research design for achieving the research aim, by conducting thorough data analysis.

3.10 RESEARCH ETHICS, RELIABILITY AND VALIDITY

According to Saunders et al. (2012), ethics are principles that guide behavior and choices made regarding a research inquiry process. It is also viewed as the code of practice for conducting any academic research, that help to establish context for behavior and the nature of relationships between the researched and what is being researched (Morgan, 2007). But Kimmel (2007) argued that ethics

in any inquiry process helps to protect the rights of all participants, and ensures that principles are adhered to. Based on this understanding, this research has been conducted using the research policy for University of Salford policy.

For example, the interviewees gave their consent and permission before interviews took place. Interviewees were also told that they had the right to withdraw at any time from participating in the research. Participants for questionnaire and interview were also informed about the confidentiality of responses provided and can be made anonymous when data is being analysed. All these guidelines were vital in determining and engaging with the research participants in KSA.

The ethical process also helped to establish the quality of the empirical process and research outcome that have been drawn using multiple sources. The use of multiple strategies and data collection techniques further confirms the extent to which validity and reliability can be made possible in a research (Collis and Hussey, 2009). For instance, the use of multiple sources could have been problematic, but this was managed using the analysis process discussed in earlier section and data triangulation which helped to examine the research phenomena in an objective way.

Validity and reliability are both important in any research especially qualitative research which is subjective and easily altered by contributions and opinions of participants. Therefore, the researcher worked hard for validity which is the degree of accuracy of any data is high enough to be taken as truth or correct (Babbie, 2012). Data accuracy is also important for reliability which is the credibility of a research findings and consistency of data collected that contributed to the results (Creswell and Miller, 2000). Reliability, therefore, focuses on developing a repeatable process which can facilitate the research at any time by anyone (Healy and Perry, 2000). This indicate that reliability and validity in a research can be challenging to achieve but not impossible especially in a phenomenology paradigm (Rescher, 2003).

As discussed in this chapter, the researcher had committed to rigor and engaged with research participants who are able to provide quality and relevant information on the topic being researched which all contributed to validity and reliability. According to Lucas (2014), validity is concerned with the researcher's ability to measure and evaluate the right concept. The right concept in this research being the research aim and objectives and ensuring that related data are collected to achieve their goal.

3.11 CHAPTER SUMMARY

This chapter has provided an overview of the research methodology. It has explained the research philosophy, approach, strategies, choices, time horizon, techniques and data collection procedure and analysis. It has emphasised the importance of the research aim and objectives in achieving the purpose of this chapter which is significant to the entire research outcome. Selecting the research design is informed by the number of elements discussed and justified in this chapter which are all vital to the next chapter.

Chapter 4 – EVALUATION OF CASE STUDIES: CAPACITY ASSESSMENT IN KSA

4.1 INTRODUCTION

This chapter presents and examines two case studies of recent disasters within the Kingdom of Saudi Arabia (KSA) in the Year 2015 and 2016 respectively. It examines recent disaster events in order to develop a better understanding of key issues in disaster response and capacity development. Also, it assesses the current capacity for response within KSA, in order to determine level of sufficiency for effective response in the future. This chapter is divided into three main sections: Section 4.2 examines the first case study scenario while, Section 4.3 examines second case study scenario. This is followed by a discussion in Section 4.4 on both case studies. Section 4.4 is crucial to this research in that it indicates the criteria for analysing the case studies and the outcomes which provides indication for the level of capacity for response in KSA. Overall, this chapter helps develop better understanding of existing disaster response capacity using two recent disaster response case studies as an exemplar, thus, it contributes to achieve the second and third research objective. The last section summarises the Chapter.

4.2 OVERVIEW OF DISASTER SCENARIO – FLOODING CASE STUDY 1

This section examines disaster response efforts in a flooding disaster that occurred in 2015. The justification for selecting this case study is to assess and determine the effectiveness of disaster response effort in each specific location and overall effectiveness of the response effort. Disasters often have a cascading impact, spreading to multiple locations within a shorter time frame, placing an intense demand on resources in the immediate aftermath of the disaster. In this case, flooding case is examined because flooding is a result of an overflow of water that covers land and disrupts normal activities (Perrow, 2011).

Flooding, whether areal, flash flooding etc. is known to cause loss of life, damage to structures, buildings and other services or infrastructures (Smith, 2013). Other indirect or secondary impacts of flooding include, but not limited to, are economic problems, increase in respiratory problems, illnesses, damage to business and homes (McCreight, 2011). These impacts emphasize the need for,

and the relevance of preparedness in reducing or preventing the impacts of flooding, especially the direct and indirect ones. Lack of preparedness to flooding events and need to have sufficient response capacity to deal with them, highlights the need for use of performance indicators to deal with them (Deng et al. 2005). For example, Figure 4.1 shows the location and progression of the floods and the major cities affected by the disaster. It also highlights vast areas that required to be covered by response teams and emergency services.

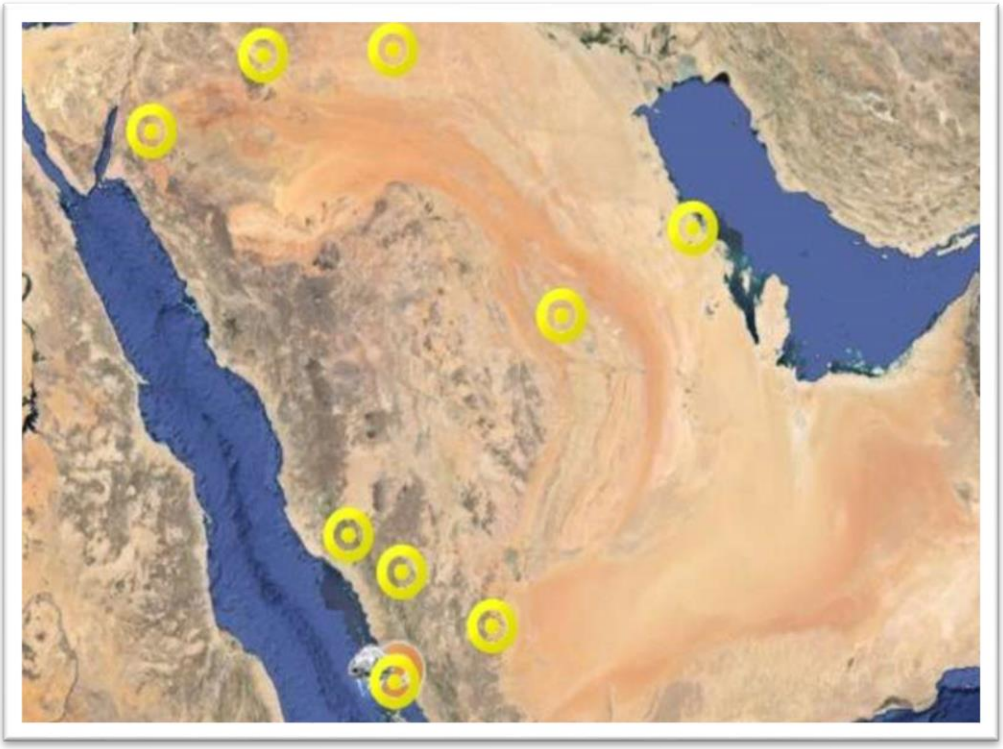

Figure 4-1: Wide spread disaster in Saudi (CDR, 2016)

The implications and the widespread impacts of disasters are shown in yellow in Figure 4.1. It highlights wide stretches of lands affected by the disaster, highlighting the need to build an effective and well-structured response capacity (UNDG, 2007), covering all levels that disaster can impact (Shuhei, 2014). For example, in November 2015, the cities of Jeddah, Mecca, Riyadh, Qassim, Tabuk, Madinah, South Saudi, Jizan, Abha Khamis, Mushayt and Taif were all significantly affected by the impact of floods, winds and flash rain, for a period of 25 days.

According to the Civil Defence Report (CDR, 2016), there were 67 victims affected by the disaster, 570 injuries and there was need to evacuate 2,000 families. The disaster caused wide spread loss of properties and disruption to utilities and services. Although this disaster required multi-agency response from the Civil Defence, police, ambulances and hospitals, ministry of education, volunteers, SMD, private sector and the ministry of interior, the impact of the disaster was huge in terms of its scale. The account by the Civil Defence (CDR, 2016) did not disclose the total cost or estimated cost for damages and recovery, but an overview of complexity of the disaster as well as lessons learned were outlined.

4.2.1 Impacts of Disaster

Reports documented on this disaster indicated that the Civil Defence experienced difficulties when responding to this disaster in 2015. For example, the rain was heavy and water levels were high to the extent that roads were affected and there was disruption to normal traffic movement. This made commuting difficult for ambulances and rescue teams, who needed to promptly carry out rescue tasks and life-saving mission. The characteristics indicate that the flooding caused direct impacts that made economic activities difficult and almost impossible in some cases since even ambulances and rescue teams could not commute.

Ease of movement for emergency services were further hindered due to lack of respect for emergency traffic regulations and laws, used during the disaster situation. The continued impact of the floods further resulted in secondary or indirect impacts that emphasizes the need for better preparedness or mitigation measures for emergency situation such as this. Figure 4.2 and 4.3 shows the impact of the disaster on people and the environment and the rescue mission to save people especially children.

Figure 4-2: Impact of flooding in Jeddah indicating stranded people and flooded streets (CDR, 2016)

Figure 4.2 shows the impact of the flood in residential areas that led to the evacuation of families to prevent further losses and cascading effects of the disaster. As noticed in the picture, cars were submerged in the flood, people were trapped in their homes, flood water overflowed to places they would not naturally be flowing, causing further damage to infrastructures. This impact shows that disaster preparedness and response capabilities were not sufficient to reduce the impact shown in Figure 4.2. For example, cars could have been moved away and people could have been evacuated, using Early Warning systems and proactive approaches, rather than being trapped in their houses (yellow arrow in the picture).

Figure 4-3: Part of rescue mission during Riyadh flood (Picture courtesy Civil Defence)

Figure 4.3 shows the rescue mission to save people, especially children and their family using a rescue boat. Despite these obvious efforts, rescue mission was still challenging in such hazardous situation where it was still raining and only means of transportation were boats. The boats used for response can only be operated by emergency responders or officers from the Civil Defense which made the rescue mission a specialized operation that can only be carried out by certain team or organization. Such specialized response arrangement makes capacity development important and necessary. Furthermore, while some citizens who understood the situation tried to stay out of dangerous situation. However, many people failed to cooperate with the Civil Defence, which further undermined the overall efforts of the emergency services.

Location of houses and buildings also complicated the situation and made response more challenging. For instance, the Civil Defence reported that some people built their houses along the valley streams. While it may have seemed like a good idea many decades ago when there was no threat of major flooding incident in Saudi Arabia, it has turned out to be a major factor because of downstream water flow, which increased the impact of the disaster on many people in Jeddah, Mecca,

Riyadh, Qassim, Tabuk, Madinah South Saudi Jizan, Abha Khamis, Mushayt and Taif regions. It can be observed that the flood caused both direct and indirect impacts in the affected locations, from whom key lessons can be learned.

4.2.2. Key Lessons Learned from Focus Group

In order to reflect on effectiveness of disaster response efforts, a focus group was conducted with four Civil Defense Officials who were involved in disaster response effort. Focus group allowed for reflection on effectiveness of response effort in a guided discussion, which was monitored and recorded by researcher. Use of focus groups is popular both within private (Kitzinger, 1994; Morgan, 1998) and public sector e.g. used focus groups for assessment of public health education efforts (e.g. Bloor et al., 2001). Focus groups were used to generate information on collective views of those who first hand participated in disaster response and meanings that lie behind those views. It was useful in developing a rich understanding of participants' experiences (Kitzinger, 1994).

Six Government officials from Ministry of Interior were invited to participate, of which four attended the focus groups. Three officials were working at a Rank of Colnel and one official was working at a Rank of Brigadier. From the focus group discussions, it can be inferred that generally held view was that disaster preparedness and response capability for the flooding incident in Riyadh was insufficient and adequate. The Civil Defence had not engaged with community, nor did they have awareness of factors that may make response more complicated for them, should a flood or any disaster occur. Lacks of disaster preparedness capacity assessment has directly affected the capacity of Civil Defence for effective disaster response.

This specific case study of floods in Riyadh and the factors that aggravated the impacts of the flood exposes the link between disaster preparedness capacity assessment and disaster response capability for confronting disasters of any size and type. Like most disaster situation, lessons that can inform improvements were identified from dealing with this disaster scenario. The following major lessons were identified based on focus group discussions and analysis of archival documents:

1) Poor communication, co-ordination and onsite collaboration between Government departments and various private agencies working together resulted in lack of effective disaster response. Roles and responsibilities were not clearly defined, resulting in delays in response efforts.

2) Limited skills in dealing with the disaster situation, indicating weaknesses in previous trainings. This was evident amongst state, private sectors and volunteers. Disaster responders as a result, were not prepared to deal with disaster situation.
3) Limited use of technology that can be used in confronting disasters. Even though where technology was available, it could not be put to use because of lack of established processes.
4) Communication systems malfunction between state and private sectors response crew. Also, training of first responders was called into question.
5) Difficulty interfacing responsibilities and missions between participating organizations (state and private) during response to disasters
6) Lack of involvement of major stakeholders within the state and private sectors and volunteers in training courses. Disasters are one-off affair and it is difficult to create a simulation of real life disaster situation and because of poorly coordinated processes, leading to limited effectiveness within disaster response
7) Absence of any risk preparedness plans. Given frequent nature of such disasters, it was possible to develop topographic maps and identify localities most exposed to risk.
8) Low involvement of certain organizations during disaster response operations. This could be due to poorly defined processes and lack of understanding of roles and responsibilities.
9) Lack of nationwide delegation in backing regulations and systems for disaster management especially in the response phase
10) Limited knowledge and social function in dealing with affected community and overall disaster situations
11) Failure to involve volunteers and training departments in response arrangement in disaster that struck in November 2015.

Above mentioned lessons identified clearly justify the need for effective response capacity assessment or a framework that can be used to determine the appropriate level of response arrangement, logistics and organisations required for dealing with disasters. The importance of a disaster capacity assessment framework within Saudi Arabia is further justified, when another disaster struck in the same geographical location in 2016, just barely four months after the first one. The next section discusses the case study and the relevance context of this study on capability assessment.

4.2.3. Discussion of Case Study

The archival documents have identified some lessons from the disaster situation, and some of these lessons demonstrate the absence of, or the need for more and better capacity assessment. The poor communication, coordination and onsite collaboration with other emergency organisations and affected communities show that no engagement with partners and consensus exist. Engagement is an important part of capacity development process which the UNDP capacity model indicates in Figure 2-2. In fact, being the first step in the capacity development process model, it leads to better success rate with assessing capacity assets and needs that may be required for responding to flooding disaster of this nature. Since the case study examined in this section indicate that there is lack of engagement and direct impacts of the flood, it follows that capacity assessment or development is lacking in KSA which is also evident from the impact of the flood in the pictures.

Furthermore, limited skills identified in the case study also expose lack of operations and procedures that meets the necessary requirements and standard procedures for emergency management functions identified in the capacity and readiness framework used in the US. Section 2.3.2 shows that there are essential emergency management functions (EMFs) which shows that there are sufficient capacities for dealing with disasters, which is absent in the case of KSA's response to the flood. Limited skills mentioned in the report also indicate insufficient functions show that operations and procedures need to be enhance for future response, but will be challenging to achieve without the initial engagement that enables partners and communities to cooperate for the purpose of building appropriate capacity for disaster resilience.

While limited use of technology may not necessary infer lack of capacity for dealing with disasters, it however reveal that emergency information systems may be impaired during disaster response. It also infers that information and communication systems and management may be insufficient since technology is known to facilitate communication and other emergency management functions and procedures (Alexander, 2005). From the case study, it can be noted that besides documenting the lessons in a report, not having capacity assessment tool in place to evaluate response capacity and performance for the flood response is detrimental to disaster resilience.

As identified from the example of New Zealand, capability assessment tool is key in determining the readiness and the performance indicators crucial in determining the level of readiness for dealing

with risks and hazards (Section 2.3.5). But this type of assessment tool appears to be lacking or not in place in KSA despite the major impact of the flood disaster, which then emphasise the need for capacity assessment for disaster response and the relevance of this research to enhancing disaster resilience in KSA. Therefore, the lack of certain best practice activities and factors identified in this section on evaluating the case study of flood disaster can be summarised as follows:

• *Lack of engagement with partners and community* • *Lack of assessment for readiness and basic emergency management functions* • *Lack of information systems* • *Limited skills for response* • *Lack of Capacity assessment tool*	**Lack of capacity assessment/development process**

While the findings from the flood disaster examined in this section cannot be ignored, the next section examines another disaster scenario so that more evidence of lack of capacity assessment can be established.

4.3 OVERVIEW OF DISASTER SCENARIO – SEVERE WEATHER CASE STUDY 2

While recovery from the impacts of the 2015 disaster was still ongoing (i.e. Case Study 1), another disaster struck on March 7th 2016, which further exposed the insufficiency of response capacity. Worst affected areas included the cities of Jeddah, Mecca, Riyadh, Qassim, Tabuk, Madinah, South Saudi, Jizan, Abha Khamis, Mushayt and Taif. These cities were adversely impacted by the impact of floods, winds, sandstorms and dust for over 50 days. It was reported that there were 36 causalities, 630 injuries and the need to evacuate about 4,000 families. These statistics indicate that the flood had direct impact on people and the environment causing fatalities and injuries, which shows that the flood had direct and severe impacts at the affected locations in KSA. Figures 4.4, 4.5 and 4.6 show the impact of the 2016 flooding within KSA and confirms these explanations.

Figure 4-4: Wide spread disruption to movement in Maccah City

The picture shows that flooding caused direct impacts on people and the affected locations in KSA. Figure 4.4 further revealed that people' ability to more around for various reasons and to carry out their duties were impacted by the flood. The direct impact of the flood disaster is also obvious from the picture showing that even cars were unable to move around to transport people. While these are the obvious direct impacts of the flood disaster documented by the civil Defence, it is likely that there are other indirect impacts caused by the flood which were undocumented given the wide spread impacts of the disaster. The impacts that have been documented are examined and analyzed in the next section.

4.3.1 Impact of Severe Weather Disaster

Figure 4.4 shows the extent of impacts and disruption to normalcy and ease of movement the disaster caused in Maccah city. Similar disruptions were experienced in Jeddah city as shown in Figure 4.5. Severe weather, followed by heavy rain swept various regions of Saudi Arabia. Many people died, injured or got trapped by heavy floods and rain. Figure 4.5 shows that people were trapped on the road amidst the flood until the civil defence assistance (in yellow arrow) arrived with a boat, but their vehicles were already submerged. Riyadh city, which is one of the major cities in KSA also witnessed

wide spread disruption and impacts that were beyond response capacity. Figure 4.6 shows the extent of damage and disruption in Riyadh city caused by the disaster.

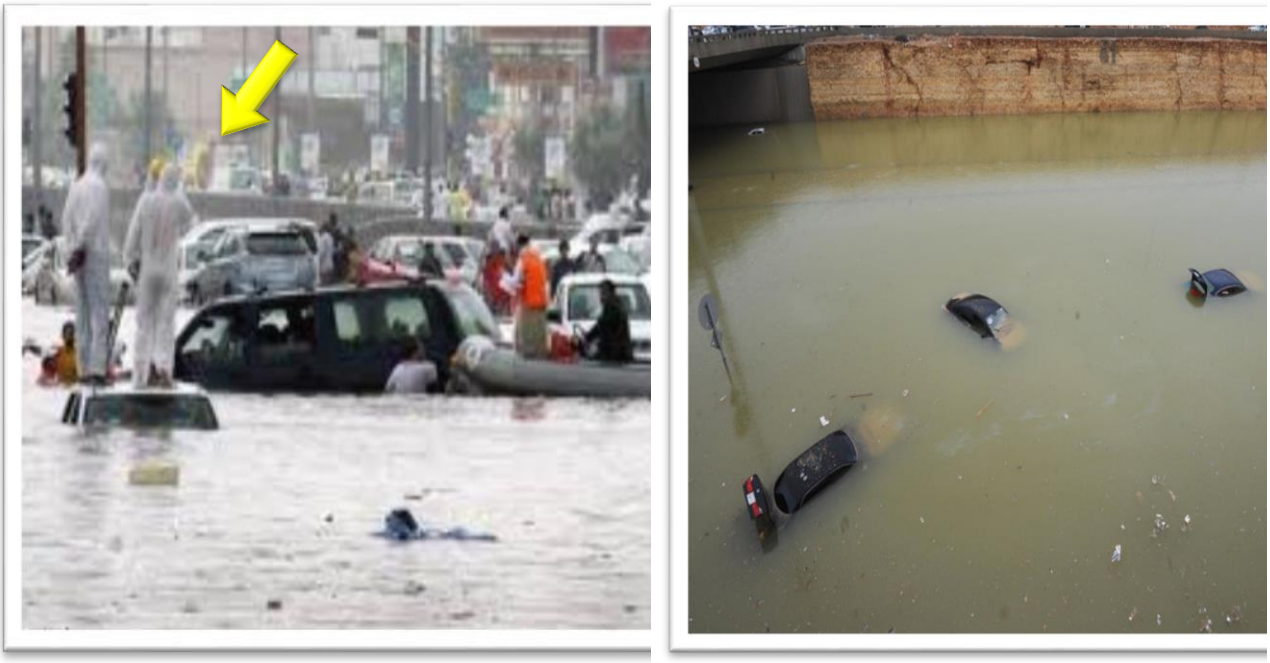

Figure 4-5: Major disruption to transportation and rescue mission in Jeddah City

As noticed in Figure 4.5, the disruption caused by the flood was wide spread and very life threatening. It some places, the impact led to situations where cars and properties were submerged to the extent that it was difficult to rescue them until the water level subsided. The severe weather also resulted in people being trapped in their vehicles and had to wait to be rescued from the flooded vehicles and road. It also shows that there were both direct and indirect impact resulting from this severe weather. Figure 4.6 shows that some of the indirect impact that led to people risking their lives to save some of their properties.

Figure 4-6: Affected people trying to rescue their vehicles in Riyadh City

Figure 4.6 show that some residents in Riyadh City had neither support nor assistance from the civil defence, when they were trapped within their vehicles. While the disaster situation also required the response of organizations and agencies such as civil defence, police, ambulances and hospitals, ministry of education, volunteers, SMD, private sector and the Ministry of Interior, the response was not well-coordinated, to prevent the loss and disruption to lives and properties. Relevant reports and supporting visual record of the disaster that occurred in 2016 demonstrates the extent of damage and the impacts caused by the disaster. While the complexity of 2016 disaster is unclear from the pictures and reports examined, there were specific lessons learned from assessing its impacts, which further justifies the need for this research.

4.3.1 Key Lessons Learned from Focus Group

In order to reflect on effectiveness of 2016 disaster response efforts, a focus group was conducted with six Civil Defence Officials who were involved in disaster response effort. Focus group allowed for reflection on effectiveness of response effort in a guided discussion, which was monitored and recorded by researcher. Focus groups were used to generate information on collective views of those who first hand participated in disaster response and meanings that lie behind those views. Six Government officials from Ministry of Interior were invited to participate, of which all attended the focus groups. All officials worked with Ministry of Interior and their job credentials are kept confidential upon request. Following key lessons were identified in focus group discussions.

1) Responders from the state and private sector displayed limited skills in dealing with the disasters. Similarly, the volunteers handling of the disaster displayed lack of skilled training in confronting disasters.
2) Lack of required technology such as observation, predictions and early warning for dealing with the disaster more appropriately.
3) Lack of communicating systems between the state and private sectors to facilitate response to the disaster
4) Interference with responsibilities and mission of response agencies when dealing with the disaster
5) Complications resulting from interpreting some elements of the plans which led to difficulty in responding to the disaster.

One key lesson identified during focus group was that certain tasks and duties of organizations and agencies responsible for disaster management must be identified and clarified. As such, it can be noticed that some of these factors were also identified during the 2015 disaster and it is evident that they have reoccurred in 2016 when the disaster happened. This emphasize the need for review of the disaster preparedness and response arrangement as well as assessing capacity for response especially a framework that can be used to assess the appropriateness of response arrangement, in view of dealing with disasters when they occur. This will ensure effective knowledge management and will ensure lessons learned from one situation are effectively implemented on another.

4.3.2. Discussion of Case Study Scenario

Accounts of the severe weather show that lessons may have been identified, but the lessons show more lack of capacity in KSA and inability of the people to hid to early warning that should have prevented them from going out. The lack of early warning system, and lack of education on importance of staying indoors or in safe areas during severe weather made people go out and in some cases risking their lives to rescue their properties. The direct and indirect impacts of the severe weather show that without a capacity assessment and development process that engages partners and communities, it is more likely that impacts of disasters of any nature severely affect people, economy and environment.

The UNDP capacity development process further reinforces the significance of the five-step process where engagement with partners and building consensus, assessing capacity assets and needs, and designing capacity development strategies are all important for developing capacity of emergency organisations and community. In addition, implementing capacity development strategies is also important for developing capacity for response, which also comes from evaluation of capacity development efforts made by all stakeholders (UNDG, 2007). However, all these are lacking in the KSA system and disaster response plan since the lessons documented reveal that both responders and private sector all displayed limited skills in dealing with the disaster, lacking the training required for effective response and timely rescue of people.

Lack of technology is also identified which led to inability to provide early warning to partners, responders and people that may have prepared them for the situation and severity of the disaster. This further complicated response for the responders and their ability to conduct disaster response was seriously affected leading to more impacts. The issues that led to the impacts of this disaster being severe appear to be more than those identified in the first case study disaster. An example of this is how lack of technology and communication systems between state and private sectors hinder ability to facilitate and coordinate response to the disaster. As may have noticed, in this case, the lack of technology seems to have caused ripple effects that complicated the response procedure and aggravated the disaster impacts.

As rightly acknowledged in the report, there was interference with responsibilities and mission of response agencies when required to deal with the disaster, therefore making the response more

difficult and in some cases impossible for them to deal with the disaster impacts or support people in some areas which were completely neglected. From the case study, not having capacity assessment tool in place to evaluate response capacity and performance for the flood response is devastating. The capability assessment tool identified in New Zealand capacity assessment process is key in assessing the readiness and the performance indicators for confirming the level of readiness sufficient for dealing with disasters (Section 2.3.5).

But any assessment tool appears to grossly lacking in KSA despite the impacts of past disasters which mandate the need for strong recommendations as intended in this research. Therefore, the absence of technology, communication systems, limited skills displayed by all agencies identified in this section are outlined below:

• *Lack of coordination between partners and agencies* • *Lack of technology* • *Limited skills displayed by all stakeholders including volunteers* • *Lack of communication systems*	**Lack of capacity assessment/development process**

Absence and limitations of these factors during the severe weather disasters reinforces the need for, and importance of this research in improving the current conditions for disaster preparedness and response. While provisions are in place for documenting lessons, there are problems and lack of engagement with partners to build consensus for disaster resilience and capacity development towards it. Therefore, this investigation process will attempt to translate the gaps identified from the case study into measures, strategies or steps that can be taken as part of the recommendations for improvement in KSA. The next section analyses the findings from the two case studies.

4.4 ANALYSIS OF CASE STUDIES

The case study of recent disasters in Saudi Arabia examined in this Section has further exposed the gaps and limitations in the current practice within disaster response in the country. Identifying similar lessons and complexity that hinder effective response to disasters indicate that capacity assessment is lacking in the system. The researcher is basing this inference of the evidence presented during the case study where causalities, injuries and evacuations were required. Various factors hampering disaster response efforts as identified in Chapter 3 (e.g. poor communication and coordination, lack of training, clear definition of roles and responsibilities) can be seen in play within these case studies, affecting capabilities of effective response.

It is also established from the case studies that the evidence of direct and indirect disaster impacts in KSA is an indication that capacity assessment and its corresponding activities are lacking in preparing the responders, partnering organisations and volunteers for disaster response. While no reference is made to whether or not equipment is sufficient, it can be noticed from some of the pictures that even with the presence of rescue equipment in some cases, responders were still unable to carry out their duties as required to save lives and properties. These are all indicators of lack of capacity assessment of the disaster management system, as well as lack of focus on risk impacts and how to assign roles and responsibilities of all emergency organizations and volunteers to deal with the risk and mitigate its impacts.

Table 2.2 in Chapter 2 may be used to further identify areas where gaps are present in order to determine the inquiry process and rationale for collecting the primary data. Various best practice features of capacity assessment frameworks are analysed based on Saudi disaster response experiences (Column 3 in Table 4.1) and areas of improvements are identified.

Table 4-1: Comparison of Global Capacity Assessment Practices with analysed cases studies

Capacity Assessment best practice features	Country identified or source	Saudi Arabia
▪ Structured	UN (UNDG, 2007)	√
▪ Focus on short and long-term impacts of risks		x
▪ Readiness arrangement that focuses on EMFs	US (FEMA, 2014)	x
▪ Cover all readiness actions and activities during the preparedness phase		√
▪ Conduct survey or ask critical questions from all stakeholders	UK (NAO, 2008)	x
▪ Critical questions should focus on risk consequences, level of capability and implementation of readiness arrangement for response		x
▪ Focus on 4 levels i.e. central government, local government, community and community groups to respond	Japan (Shuhei, 2014)	x
▪ Comprehensive to cover all phases		x
▪ Conduct evaluation post response to determine if capacity i.e. equipment, skills facilities, resources were sufficient		x
▪ Tool that identifies gaps, areas of improvement, strengths and weakness	New Zealand (Civil Defence NZ, 2014)	√
▪ Periodic or regular assessment must be done		x
▪ Use of performance indicators	Taiwan (Deng et al. 2005)	x
▪ Define & use of Primary and Secondary indexes		x
▪ Capacity assessment system/framework must be multi-hazard that ensures that consequences of hazards are prevented and risks are mitigated		x

It can be seen that there are very few best practice in capacity assessment practiced in Saudi Arabia, especially ones that align with the best practice identified in literature review. The Table 4.1 shows that while structure exists in the Saudi system and readiness actions and activities are indicated in the disaster management arrangements as reviewed in the literature chapter section 2.4, it appears actual response capability does not measure up to what is required during disasters. As noticed in the Table above, other best practice for capacity assessment are also lacking, which may be one of the factors responsible for inadequate response.

However, this is an assumption that need to be investigated through the fieldwork inquiry. Although it seems tools exists for identifying gaps and areas of improvement as outlined in the case studies which showed the complexity and lessons learned in each disaster scenario. However, it is evident that the current practice in Saudi Arabia are insufficient and have continued to aggravate the disaster impact in the country. Hence, the next section presents result of responses provided by the experts regarding the gaps identified in the literature review and via this case study analysis.

4.5 CHAPTER SUMMARY

This chapter has critically examined case studies of disaster scenarios which indicate that the response capacity for dealing with disasters in KSA may be insufficient. In addition to this, the chapter has shown that disasters occur frequently in KSA and as such may not leave sufficient time for capturing learned lessons to be put into consideration and influence planning for future disasters. In this sense, it appears that approaches for assessing response capacity may not be effective enough. The case study analysis further indicates that one of the key challenges that may continue to influence capacity assessment methods used in KSA is the frequency of disaster occurrence that makes it difficult for the same organisations to both identify lessons, learn and incorporate them for future planning.

Therefore, the case study analysis reveal that it is important that the competency assessment framework is developed to incorporate arrangement for monitoring and evaluation that is simultaneously conducted pre-disaster, during and post disasters. Shuhei (2014) also highlighted the need for a response capacity assessment activity, that is embedded into the phases of disaster management perhaps one that includes tool that identifies gaps, areas of improvement, strengths and weaknesses (Civil Defence NZ, 2014).

Despite the outcome of the case study analysis, the key challenges in disaster response capacity assessment methods used in Saudi Arabia remains based on assumptions and not yet verified using a scientific method. Therefore, the next chapter focuses on presenting findings from questionnaire and interview sessions conducted in KSA in order to ascertain challenges identified from the case study analysis. Through the primary data collection, information gathered is also constituted as means of evaluating the existing capacity assessment of methods and approaches used in KSA.

Chapter 5 DISASTER RESPONSE CAPACITY ASSESSMENT FRAMEWORK DEVELOPMENT

5.1 INTRODUCTION

This chapter aims to achieve the fourth research objective which is "to develop framework for assessing preparedness and response capability in Saudi Arabia". Achieving this objective is crucial because the objective is at the core of this research since the research aim is "to develop a capacity assessment framework to enhance disaster preparedness and response capabilities within Kingdom of Saudi Arabia". This Chapter presents the process followed for development of Disaster response capacity framework development. Key themes that are covered in this Chapter include:

- Capacity assessment and methodologies used for disaster management in KSA
- Existing capacity assessment methods in KSA used for disaster preparedness and response
- Impacts of challenges on capability for response
- Key CSF that may be used for capacity assessment framework in KSA

5.2 Need for Disaster Response Capacity Assessment Framework

Chapter Four presented results of case study review and challenges in terms of capacity assessment and methodologies used for disaster management in Kingdom of Saudi Arabia (KSA). The case study analysis and focus group discussions have also helped to better understand themes examined in the chapters two and various reasons for insufficient disaster response within KSA. As intended in this section, subsections focus on providing a brief discussion on essential elements that contributes to the overall Disaster Response capacity assessment framework designed for KSA disaster preparedness and response capacity enhancement.

5.2.1 Disaster Response Capacity Assessment Methodologies

The case study analysis presented in chapter four revealed that lapses exist in the disaster response system within KSA and that the capacity assessment methodologies used in KSA are ad hoc and not efficient enough for dealing with the type of disaster plaguing KSA in recent years. The focus group

inquiry and documentary data analysed in Chapter 4 exposed that there are attempts to bring international methodologies, but as shown in case studies examined and the justifications for this research, it is evident that these capacity assessment methodologies are not efficient. The case study analysis also revealed that responders exhibited limited skills, lack of communication systems, interference with responsibilities and complications (Section 4.3 & Section 4.4), to mention few of the identified issues. However, this analysis revealed that although KSA tend to have some of the capacity assessment best practice features (Table 4.1) such as; structured system, readiness arrangements that focuses on EMFs, arrangements that cover all readiness actions and activities during the preparedness phase, the actual response action plan does not demonstrate best practice arrangement.

The results also show that the following elements of best practice are missing in within existing disaster response approaches used within KSA:

1. Focus on short term and long-term view of risks is often not taken
2. Conduct survey or ask critical questions from all stakeholder (NAO, 2008) which is practiced in the UK system
3. Asking critical questions focusing on risk consequences, level of capability and implementation of readiness arrangement for response
4. Focus on the four levels i.e. central government, local government, community and community groups to respond (Shuhei, 2014), as seen in the Japanese system
5. Comprehensive and integrated approaches, to cover all disaster phases and multiple teams involved in a disaster response effort
6. Conduct of evaluation post-response to determine if capacity i.e. equipment, skills facilities, resources, were sufficient
7. Periodic or regular assessment to ensure regular monitor and evaluation
8. Use of performance indicators (Deng et al., 2005) as is the case in Taiwan best practice (Chapter 2)
9. Define and use primary and secondary indexes
10. Capacity assessment system/framework must be multi-hazard that ensures that consequences of hazard are prevented and risks are mitigated

None of the primary data available about disaster response capacity within KSA Ministry of Interior appear to suggest that data is not existing, which is backed up by data gathered through Interviews and focus groups. Since the research participants are experts, it can be assumed that they will be informed about these best practices if they are in place, therefore leading to the conclusion that they are non-existent in the KSA system. As such a gap that exposes absence of ten major best practices in the practice of disaster management strongly justifies the need for developing a consistent approach to disaster capacity assessment within KSA.

Another gap identified from the results for this objective is that there is gap between best practice methodologies adopted from foreign countries and the operations being carried out in KSA. This may be due to compatibility of system since the capacity assessment methodologies are from other developed countries and the UN. Lack of understanding or training in the arrangement or techniques for implementing the foreign capacity assessment methodologies adopted for use in KSA, is another reason that may be responsible for inefficiency of the capacity assessment method in the country. Whatever the case is, it can be observed that the UN and other foreign capacity methodologies identified through the interview sessions used in KSA are not effective and/or suitable for the KSA preparedness and response structured system.

5.2.2 Existing Disaster Response Assessment Methods and Approaches in KSA

In terms of existing methods and approaches in KSA, which is a theme relating to the second objective, it was discovered that despite having UN and other foreign capacity assessment method, training, experiences and individual abilities, no consistent approach is being used across the board. The approaches identified and explained by the research participants show that preparedness actions and activities are conducted, there are readiness arrangement, as well as trainings conducted to improve the system. However, the impacts disasters (as analysed in chapter four) create in KSA challenges the existing methods and approaches suggesting that they are insufficient or ineffective.

Results from literature review identified combinations of methods and approaches that are used for assessing capacity for response across the world. However, the primary data on KSA shows that many of these best practice methods and approaches are unknown in KSA even among the experts. Furthermore, plans and trainings seem to be the two generally acknowledged approaches for preparing to deal with disasters. Although one of the preparedness arrangements identified by

Alexander (2002), they are not enough for developing capacity for responding to modern time disasters which cause widespread cascading impacts, given highly engineered urban infrastructure. Therefore, the results for this theme and objective is that, there is a knowledge gap in terms of how to effectively deploy disaster response maturity assessment approaches, planning, training and preparedness actions and capacity assessment methods within KSA context. Hence, there is need for a capacity assessment framework suited to local needs, thereby justifying the relevance of research aim.

5.3. Prioritisation of Critical Success Factors for DRCA Framework

This section is informed by Section 2.6 which outlined Critical Success Factors (CSF) developed as part of the research. List of 15 critical success factors for disaster capacity readiness were identified from literature review and best practice review (Section 2.5). Factors were identified from global literature and it is important to assess identified factors with Saudi experts, to contextualise identified factors from a Saudi perspective and to help identify most important factors from Saudi disaster response capability enhancement viewpoint. The stratified sampling method is used to select participants for the questionnaire because of the tendency of their answers, information and data provided to enable the variables being tested to be ascertained or verified. Stratified sampling method is used to select and partition the population (Collis and Hussey, 2013). The partition is made from those who work in the emergency sector in KSA to increase the likelihood to generate the appropriate answers to prioritizing the Critical Success Factors.

For prioritizing identified 15 Critical Success Factors from Saudi Perspective, various approaches as elaborated within body of knowledge of Multi-Criteria Decision Making was explored. For prioritising identified factors, Analytical Hierarchical Process (AHP) was used. AHP is one of the most commonly used Multi-Criteria Decision Making tool. AHP is used to derive relative importance of identified data requirements using pairwise comparison. Technique was developed by mathematician, Prof Saaty (2006) using an algorithm based on pair-wise comparisons. It involves prioritising factors on a scale from 1 to 9, allowing different elements to be compared to one another in a consistent manner. It is used to derive relative importance of identified data requirements using pairwise comparison.

Technique was developed by mathematician, Prof Saaty (2006) using an algorithm based on pair-wise comparisons. It involves prioritising factors on a scale from 1 to 9, allowing different elements to be compared to one another in a consistent manner. AHP technique is based on assumption that humans are more capable of making a relative judgement when faced with two options, in comparison with making an absolute judgement (Saaty, 2006). AHP method has widely been applied for decision making and produces traceable results in forms of priority vectors. Literature review indicate that previously researchers have used similar approaches in prioritising factors. For instance, Zhang et al. (2007) refers to use of AHP technique by U.S. Federal Emergency Management Agency (FEMA) to determine the weight of each index as part of building the city emergency capacity evaluation index system. Wu and Wu (2011) used AHP technique in building the evaluation system and a comprehensive evaluation model to the fire emergency capability in city community.

5.3.1. Method used for Pair Wise Comparison

Using pair wise comparison, priorities of various Critical Success Factors (CSF) identified from literature review were determined. Pair wise comparison is a key idea of AHP process as proposed by Saaty (2006). It helps to convert subjective assessment of relative importance into computable weighting factors. Each of the 15 CSF identified from literature review were compared and a priority value was assigned on a scale from 1 to 9, allowing for comparison of all CSFs in a consistent and rational manner. To allow for expression of differences in importance between key criteria, Saaty 9-point scale begins with the value "1" indicating criteria which are equally important.

Typically, it continues with steps of two in odd numbers until "9", in cases where first factor is more important than the second. To express the opposite relation, i.e. factor A is less significant than factor B, reciprocal rating values e.g. 1/9, is assigned. According to Wu and Wu (2011), a 9 point Saaty scale is a very practical option, given it allows for capabilities of humans to make differentiations.

Intensity of importance	Definition	Explanation
1	Equal importance	Two activities contribute equally to objective
3	Weak importance of one over another	Experience and judgment slightly favor one activity over another
5	Essential or strong importance	Experience and judgment strongly favor one activity over another
7	Demonstrated importance	An activity is strongly favored and its dominance demonstrated in practice
9	Absolute importance	The evidence favoring one activity over another is the highest possible order of affirmation
2,4,6,8	Intermediate values between the two adjacent judgments	When compromise is needed

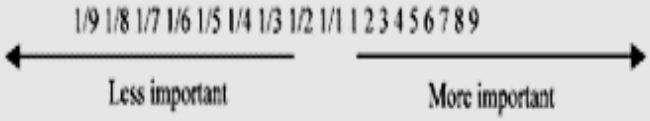

Figure 5-1: 9-point rating scale of relative importance as suggested by Saaty (1977)

The AHP analysis tool (bpmsg, 2016) was used to ensure an objective process that enable all 15 key factors identified from the literature chapter to be compared in a pair format process as shown below. Using 9-point scale, the AHP analysis, the questionnaire was set up to identify the most important factors which is shown in green in Table 5.2.

A - Importance - or B?		Equal	How much more?
Community Engagement	or Effectiveness of Response Plan	**1**	2 **3** 4 **5** 6 **7** 8 **9**
Community Engagement	or Effective Disaster Logistics	**1**	2 **3** 4 **5** 6 **7** 8 **9**
Community Engagement	or Inter-Organisational Structure	**1**	2 **3** 4 **5** 6 **7** 8 **9**
Community Engagement	or Communications (inter-org)	**1**	2 **3** 4 **5** 6 **7** 8 **9**

Figure 5-2: Pair Wise Comparison Matrix

A questionnaire was used to prioritize critical success factors deemed applicable in the Saudi context, since the literature review identified fifteen factors. Different sections in the literature review outlined Critical Success Factors (CSF) that exist and may be applicable for determining capacity for dealing with disasters. List of 15 key critical success factors for effective disaster response were identified from global context in literature and it is important to assess the identified factors with Saudi experts from disaster response capability enhancement viewpoint. People who completed the pair wise comparison questionnaire (Appendix F) were from Ministry of Interior, Civil Defence, Jeddah and Riyadh. A total of 21 participants completed the questionnaires and their demographic information is shown in the figure below.

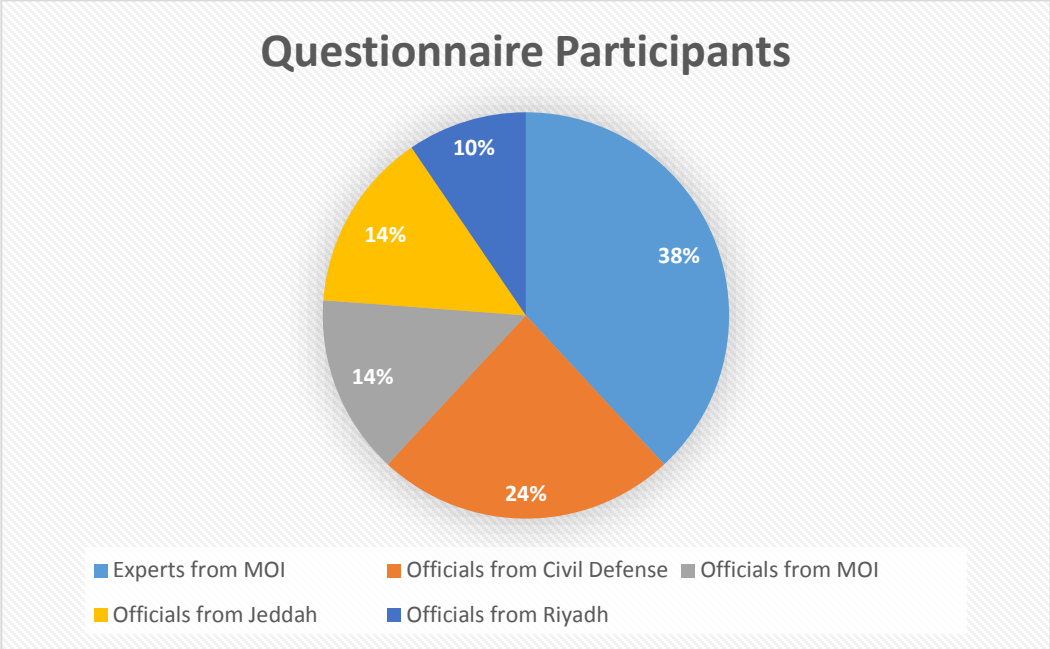

Figure 5-3: Demography of Pairwise questionnaire participants

The information shows a balanced selection of experienced people from KSA, who are responsible for dealing with disasters. Since the questionnaire focused mainly on prioritising critical success factors that were identified in the literature review, the Analytical Hierarchical Process (AHP) was used. Pair wise comparison involved prioritizing factors on a scale from 1 to 9, allowing different elements to be compared to one another in a consistent manner. Literature review indicates that previously researchers have used similar approaches in prioritizing factors. For instance, Zhang et al. (2007) refers to use of AHP technique by U.S. Federal Emergency Management Agency (FEMA) to determine the weight of each index as part of building the city emergency capacity evaluation index system. Wu and Wu (2011) used AHP technique in building the evaluation system and a comprehensive evaluation model to the fire emergency capability in city community.

Pair wise comparison algorithm by Saaty (2006) involves development of a pair wise comparison matrix and subsequent calculation of highest eigenvalues. Table below provides a summary of pair wise comparison in form of a squared matrix, with all 15 CSFs on sides of rows and columns. Given there were 15 CSFs, a total of 105 comparisons were made. Principle eigen value was 17.409. Consistency Ratio (CR) of 9.2% was achieved. Consistency Ratio measures consistency of subjective assessment. According to Saaty (2006), if consistency ratio is less than or equal to 10%, the

inconsistency is acceptable. If consistency ratio is greater than 10%, it is suggested to revise subjective assessments.

Table 5-1 Pair Wise Comparison Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1	2.00	9.00	2.00	2.00	7.00	9.00	1.00	7.00	6.00	8.00	9.00	7.00	7.00	7.00
2	0.50	1	8.00	2.00	2.00	3.00	8.00	2.00	7.00	5.00	7.00	8.00	7.00	7.00	9.00
3	0.11	0.12	1	0.11	0.11	3.00	1.00	0.11	0.50	0.25	1.00	1.00	0.50	1.00	1.00
4	0.50	0.50	9.00	1	1.00	7.00	9.00	1.00	9.00	8.00	8.00	6.00	8.00	8.00	9.00
5	0.50	0.50	9.00	1.00	1	9.00	9.00	1.00	9.00	7.00	7.00	7.00	7.00	7.00	9.00
6	0.14	0.33	0.33	0.14	0.11	1	1.00	0.20	1.00	1.00	1.00	1.00	1.00	1.00	1.00
7	0.11	0.12	1.00	0.11	0.11	1.00	1	0.11	0.33	5.00	5.00	9.00	2.00	7.00	7.00
8	1.00	0.50	9.00	1.00	1.00	5.00	9.00	1	9.00	8.00	9.00	9.00	9.00	7.00	9.00
9	0.14	0.14	2.00	0.11	0.11	1.00	3.00	0.11	1	3.00	1.00	4.00	5.00	3.00	4.00
10	0.17	0.20	4.00	0.12	0.14	1.00	0.20	0.12	0.33	1	2.00	1.00	2.00	3.00	3.00
11	0.12	0.14	1.00	0.12	0.14	1.00	0.20	0.11	1.00	0.50	1	2.00	1.00	2.00	1.00
12	0.11	0.12	1.00	0.17	0.14	1.00	0.11	0.11	0.25	1.00	0.50	1	1.00	2.00	1.00
13	0.14	0.14	2.00	0.12	0.14	1.00	0.50	0.11	0.20	0.50	1.00	1.00	1	2.00	1.00
14	0.14	0.14	1.00	0.12	0.14	1.00	0.14	0.14	0.33	0.33	0.50	0.50	0.50	1	2.00
15	0.14	0.11	1.00	0.11	0.11	1.00	0.14	0.11	0.25	0.33	1.00	1.00	1.00	0.50	1

With the highest five prioritized and indicated in in Table 5.2, the CSF were classified in order of priority by the participants and examined more critically in relation to achieving objective three for this study. Identifying these five CSF as priority imply that community engagement, effectiveness of response plan, training of first responders, inter-organisational structure and communications (inter-org) are key to ensuring sufficient capability for disaster response in any emergency organization and the Civil Defence in KSA inclusive. While the CSF prioritized by the participants are important, there were also other factors considered important for each CSF to function effectively, which are also linked to each CSF. These are outlined below in relation to each CSF. It can be noticed in Table 5.3 that community engagement is ranked first with the highest priority percentage, while effectiveness of response plan is next in rank.

The brief evaluation and assessment of the CSFs 1, 2, 3,4 and 5 identified and ranked by Saudi experts as the most important and essential for capacity assessment have shown further gaps in the system and level of knowledge regarding capacity assessment in Saudi Arabia. With respects to capacity assessment frameworks and methodologies examined in section 2.3 in chapter two, it can be noticed that factors that enable other countries identify risks and link the risks identified to response arrangements are lacking in the Saudi system. For example, the following are not identified or included in any of the CSFs 1,2,3,4 and 5:

a) Assessing capacity assets and needs (UNDG, 2007)
b) Designing, implementing and evaluation of capacity development strategies (UNDG, 2007)
c) Examination of operational readiness, capabilities of government organisations to mitigate, prepare for, respond to and recover from disaster like the CAR framework and its focus on emergency management functions (FEMA, 2014)
d) Lack of link between risks Saudi faces with implementation and readiness arrangement like in the UK national capabilities framework (NAO, 2008)
e) Good interactions, coordination, communication and management between all government tiers and community as seen in the Japan disaster management system (Shuhei, 2014).
f) Lack of indexes that helps to measure level of performance and to evaluate capability like the Taiwanese system in Table 2.1 are also not included in any of the CSFs identified and ranked by the Saudi Arabian experts.

This means that while the literature review chapter has been key in confirming the impacts, importance and relevance of CSFs in capacity assessment framework, the CSFs identified in Saudi are insufficient. In addition to this, the analysis further indicates that the challenges that exist in the Saudi disaster management system have more negative impact in limiting the effectiveness of response arrangement for dealing with disasters and catastrophes than the CSFs on enhancing the effectiveness of response. Hence, it is important to develop a framework that focuses on assessing disaster preparedness and response capability in Saudi Arabia as indicated in the research objectives. However, it is now equally important based on the outcomes of the first three objectives that the capability framework need to possess components that ensures that challenges are managed, while

capacity assessment methods and strategies include performance indicators and CSFs that include all the points outlined in (a) to (f) above.

Table 5-2: Priority Ranking Results

Category		Priority	Rank
1	Community Engagement	17.3%	1
2	Effectiveness of Response Plan	15.8%	2
3	Effective Disaster Logistics	1.8%	10
4	Inter-Organisational Structure	14.6%	4
5	Communications (inter-org)	14.5%	5
6	Communications (intra-org)	2.1%	9
7	Financial Planning	4.5%	6
8	Training of first responders	15.2%	3
9	Regular disaster drills	3.9%	7
10	Quick Response	2.5%	8
11	Army Involvement	1.8%	11
12	Technology Involvement	1.5%	13
13	Disaster Needs Assessment	1.7%	12
14	Continuous improvement	1.4%	14
15	Monitoring and Control	1.3%	15

Table 5.2 shows the ranking outcomes both in percentage and in cumulated ranks ascribed to them. It can be noticed from the ranking that community engagement has the most percentage, which is followed by effectiveness of response, then training of fire responders, inter-organizational structure and the fifth being communications (inter-org).

5.3.2. Identification of Key Goals Corresponding to Each Critical Success Factor

Corresponding to each KPI, set of key goals were identified to enable realization of KPI. These goals were identified based on evidence gained from literature review and discussions that took place as part of Interviews and focus groups. DRCA framework has three layers, where first layer comprised Critical Success Factors. Second layer, comprise key goals and objectives necessary to achieve the CSF. Third layer comprised Quantifiable performance measures. Key goals corresponding to each Critical Factor. Initial set of goals were developed by author based on literature review and personal experience (Appendix D), which were validated by participants engaged in pair-wise comparison exercise. The validation went through a 3-layer process that led to the development of DRCA framework in Figure 5.4.

Figure 5-4: 3 Layers of DRCA framework

The 3-layer DRCA framework is key to this research findings because it shows the relationship or flow from critical success factors, then to goal and then to the third level which is: quantifiable performance measures. From this framework, it was then possible to derive the corresponding goals of CSFs. The CSFs and corresponding goals for each CSF are outlined in table 5.3.

Table 5-3: Critical Success Factors and Corresponding Goals

CSF 1 – Community engagement	G1 – achieve integrated planning G2 – Public education about disaster preparedness G3 – Enhancing community resilience G4 – Public information management G5 – Support for volunteer participation
CSF2 – Effective response plan/planning	G1 – Use of proactive disaster risk reduction strategies G2 – Better understanding of disasters G3 – increased co-ordination between agencies involved
CSF3 – Training of first responders	G1 – Improved training programmes G2 – Professional development G3 - Regular disaster drills
CSF4 – Inter-organizational structure	G1 – Business continuity G2 – Culture G3 – Organizational structure
CSF5 – Communications (inter-org)	G1 – Formal reporting systems G2 – Clear accountability G3 – Improving communication flow processes

Table 5.3 shows that each CSF has its corresponding goals which need to be achieved in order for the five prioritised CSF to contribute to increase capacity for response, and disaster resilience. It also implies that having knowledge of the CSFs is not enough, but it is equally important to ensure that the corresponding goals are achieved and sustained. These requirements make it important to consider the key building blocks of DRCA framework that may translate the CSFs into achieving the overall purpose of resilience. The next section examines the process and key building blocks for DRCA Framework.

5.3.3. Key Building Blocks of DRCA Framework

Each CSF possesses its corresponding goals, which helps to achieve aim of CSF. For instance, under CSF1, the participants identified five goals as essential leading to enhancement of community engagement. This process is repeated for all five CSF which were prioritized as most relevant to the Saudi context. Based on this, the five CSF were designed into an illustrative structure for better analysis and understanding in Figures 5.5 to 5.10. Figure 5.5 is the goals that relate to CSF1 which is enhancing community engagement.

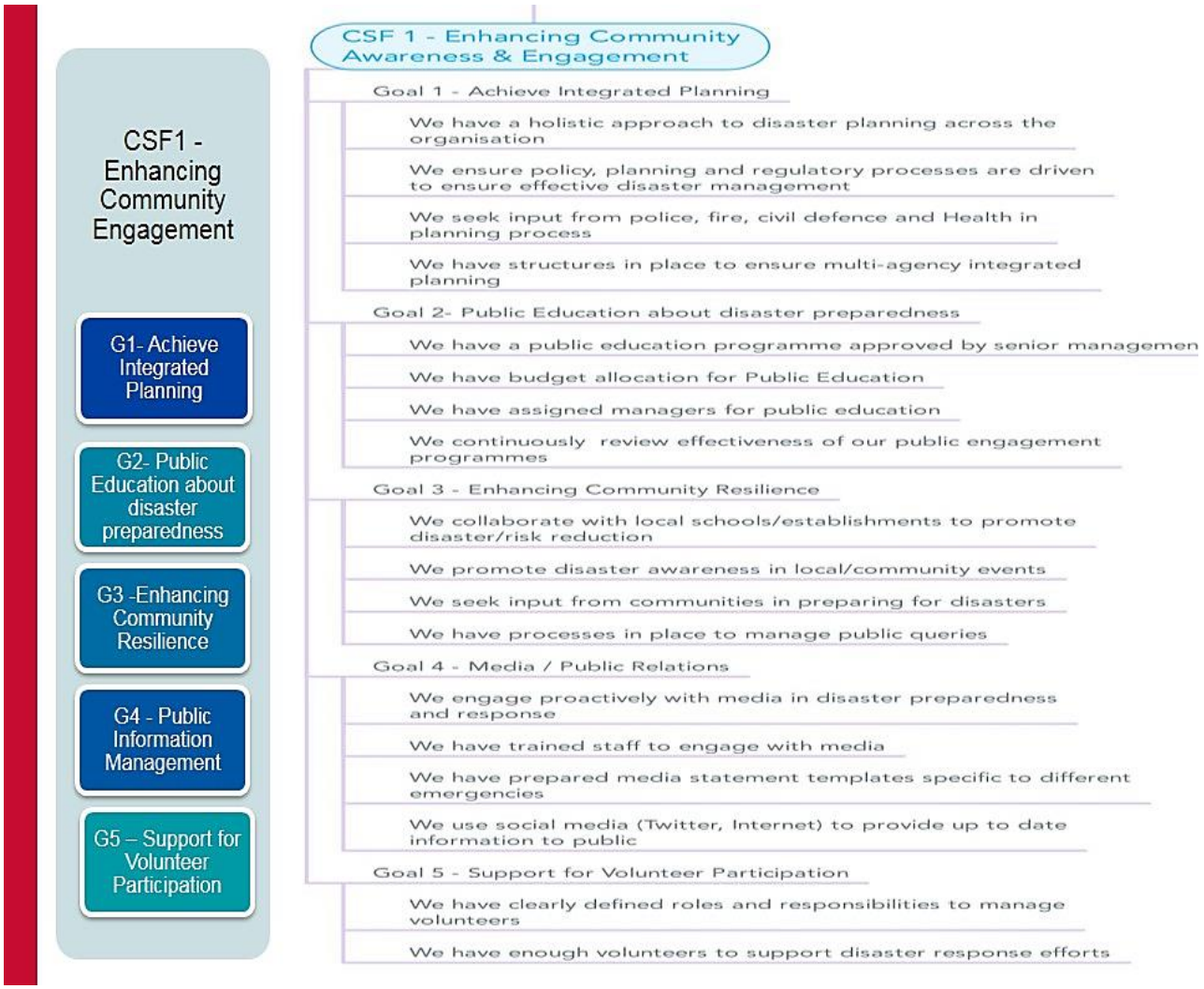

Figure 5-5: CSF1 and its corresponding goals

As seen in Figure 5.5, CSF1 i.e. enhancing community engagement, need to cover 5 goals aimed at ensuring that each goal have activities that leads to the community engagement being enhanced. This process is also the same for the remaining four CSF identified by the participants.

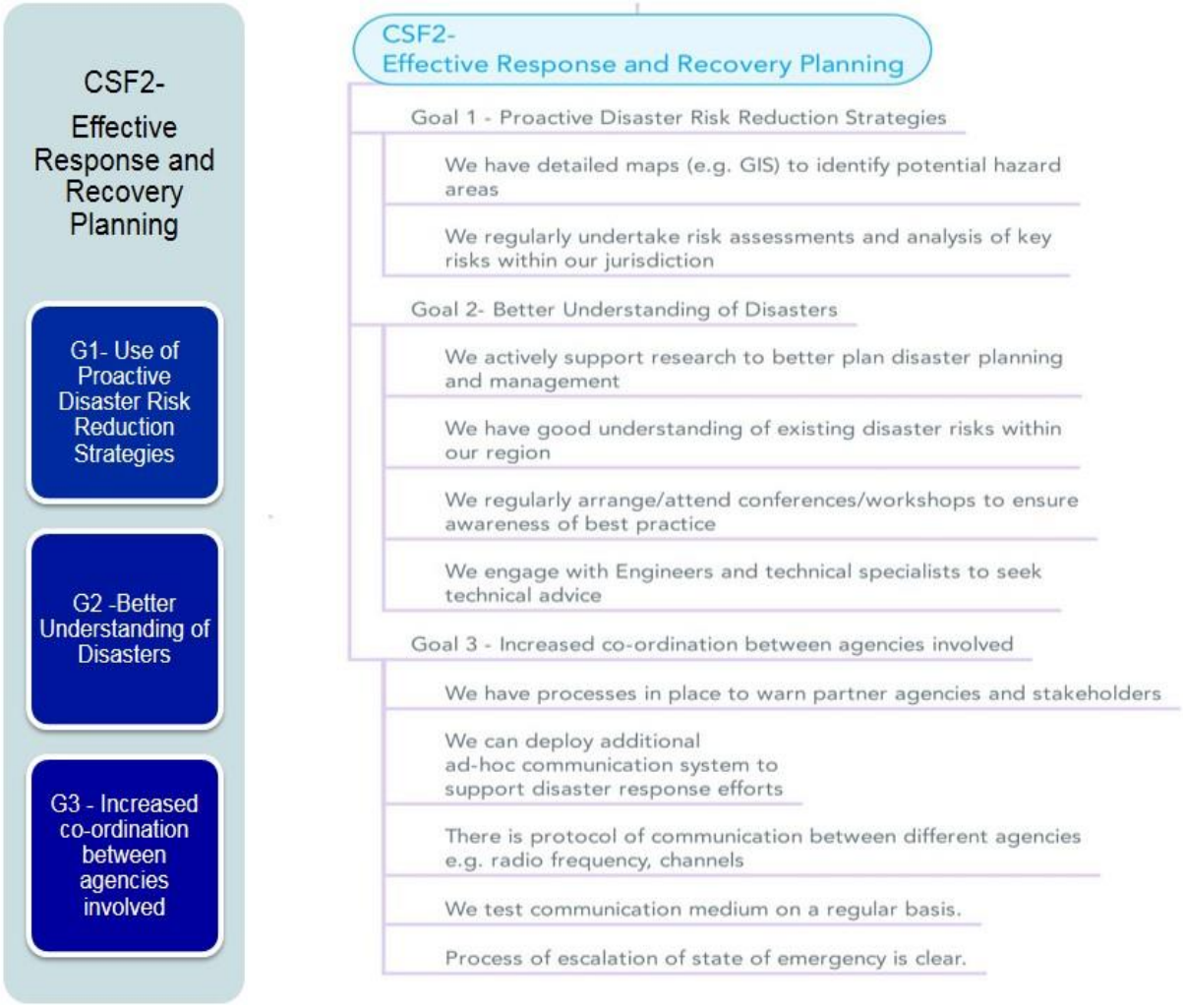

Figure 5-6: CSF2 (Effective Response and Recovery Planning) and its corresponding goals

Unlike CSF1, Figure 5.6 indicates that CSF2 has three goals identified and that it aims to ensure that both response and recovery planning are more effective. However, it can be noticed that CFS2 lacks any components that focuses on capacity assessment and performance evaluation for determining response capability and strategies are sufficient for dealing with disasters. This omission further

emphasizes the need for and importance of a framework that addresses gaps such as this as well as ensuring better and more effective preparedness for future disasters in Saudi Arabia.

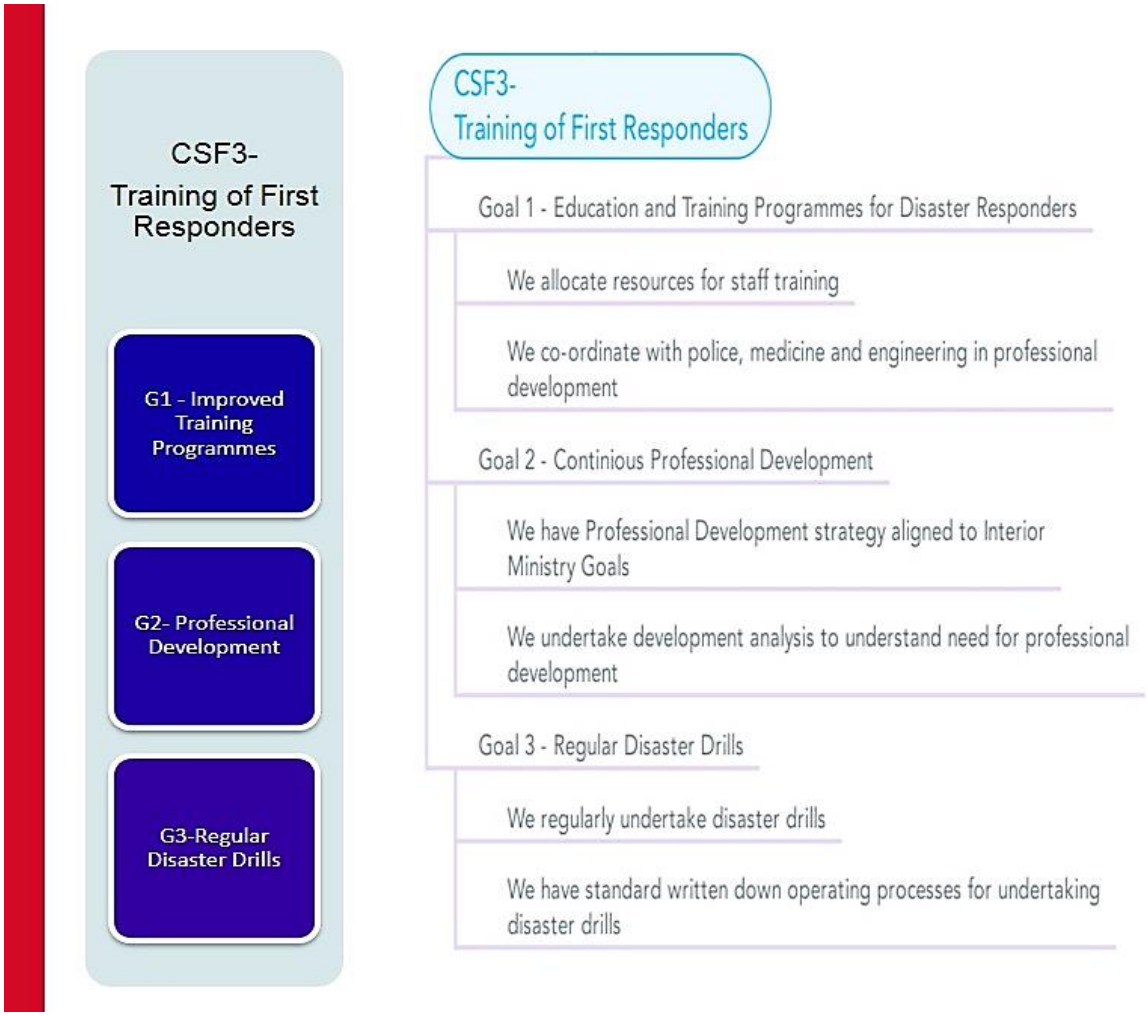

Figure 5-7: CSF3 and its corresponding goals

Similarly, Figure 5.7 shows that CSF3 has three goals which focus on improving training of first responders. The corresponding goals for CSF3 focus on education and training programmes for disaster responders which ensures that resources are well assigned or allocated to responders, while the second goal focuses on continuous professional development. The first two goals lead to the achievement of the third goal which is regular disaster drills that prepare the responders for any foreseen or future disasters. The three goals of this CSF are important to capacity development in

KSA or any country in combatting disaster of any size or type effectively. But the functionality and effectiveness of this CSF may be identified and assessed through the overall organizational structure and system in place. CSF4 indicate the corresponding goals that lead to this and ensures that CSF4 contribute to disaster resilience.

Figure 5-8: CSF4 and its corresponding goals

CSF4 have three goals which aim to increase the effectiveness of inter organizational communications as seen in Figure 5.8. It covers three key dimensions of business continuity, Culture and organizational structure. This will help an organization to help disaster managers and responders to assess capacity assets and needs, design capacity development strategies most suitable for the

disaster encountered, implement capacity development strategies and evaluate capacity development efforts (UNDG, 2007).

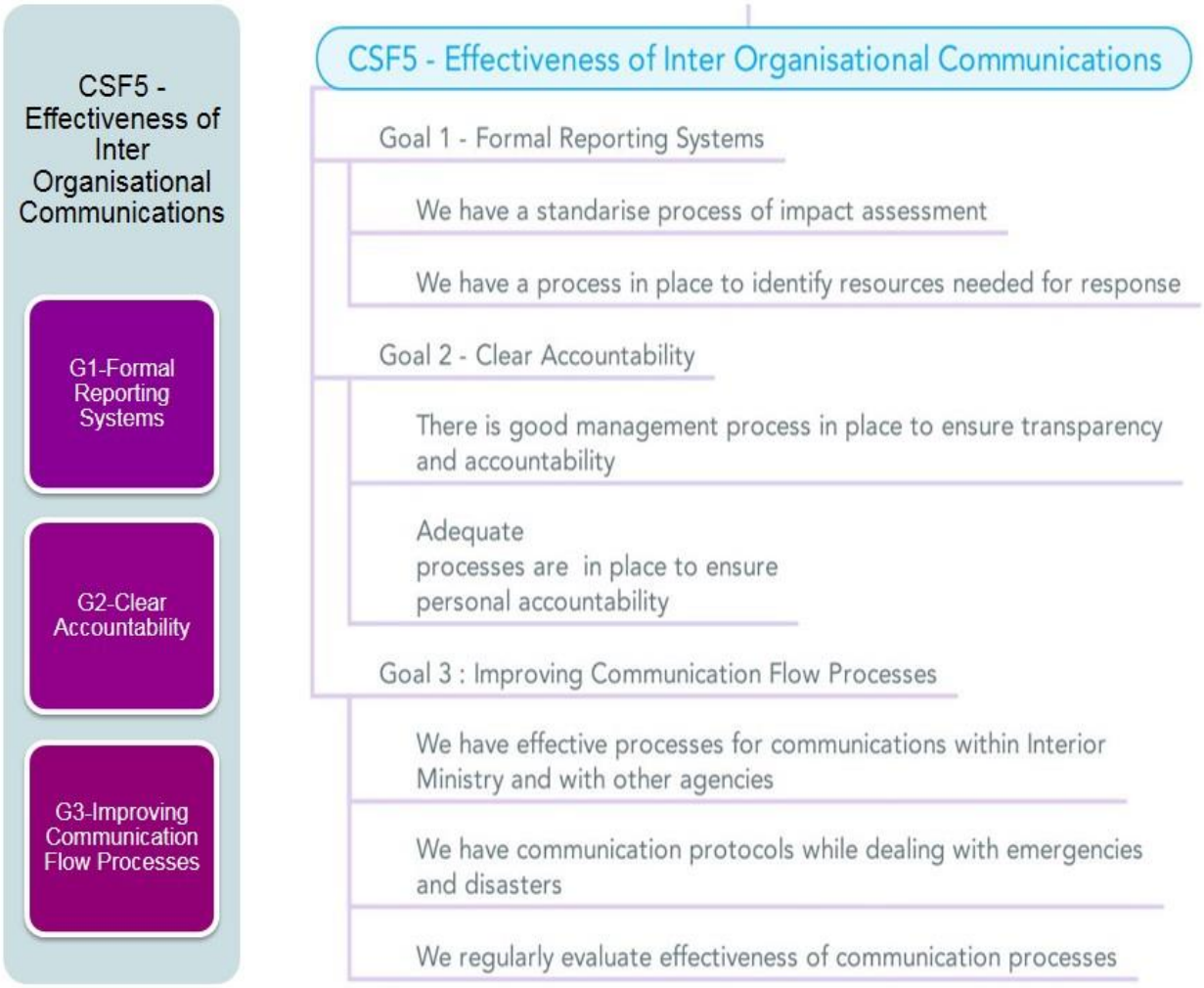

Figure 5-9: CSF 5 and its corresponding goals

CSF5 also has three corresponding goals to translate into effectiveness of inter organisational communications. To achieve this overall goal, there is need to develop formal reporting systems, clear accountability for communication, and improvement of communication flow processes. While these may be challenging to achieve with different organisations involved and trying to work together for the purpose of disaster resilience and response, it is necessary and may be achieved through the

CSFs identified and prioritised in this research. A summary view of all CSFs and goals are presented in Fig 5.10.

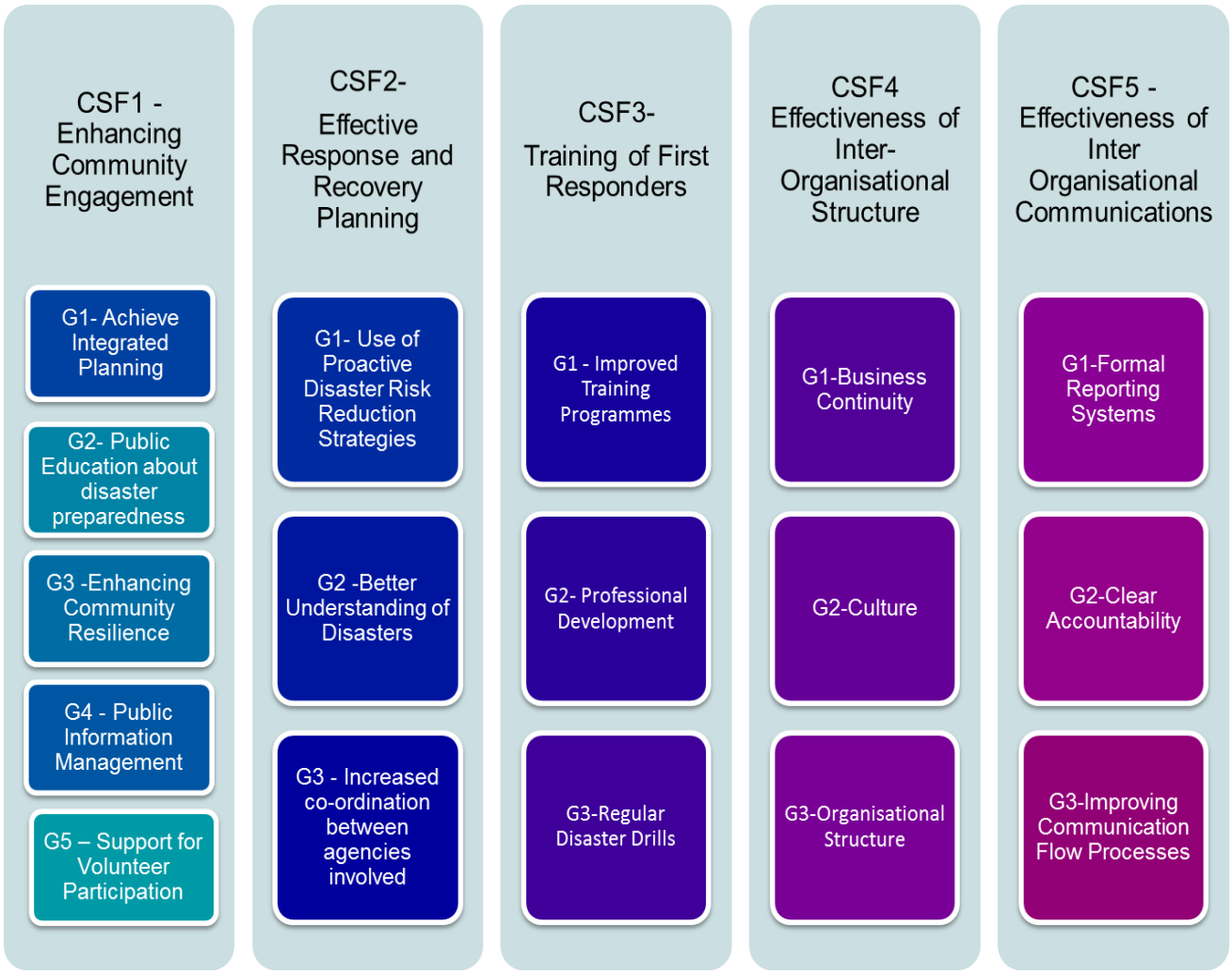

Figure 5-10: Disaster Management Capacity Assessment Framework.

The summarised DMCA framework is a building block for achieving resilience. The framework contains all five CSFs and their corresponding goals which are crucial to capacity assessment and in achieving disaster resilience in KSA as derived from the research inquiry process. Although the

framework does not show how connected the CSFs are within the framework, it is important to note that the achievement of one is key to achieving and sustaining the goal of the other such that disaster resilience is feasible and may be achieved. Therefore, the DMCA can be outlined as follows:

CSFs	Corresponding goals
CSF1 – Enhancing Community Engagement	- Achieve integrated planning - Public education about disaster preparedness - Enhancing community resilience - Public information management - Support for volunteer participation
CSF2- Effective response and recovery planning	- Use of proactive disaster risk reduction strategies - Better understanding of disasters - Increased understanding of disasters
CSF3 – Training of fire responders	- Improved training programmes - Professional development - Regular disaster drills
CSF4 – Effectiveness of inter-organisational structure	- Business continuity - Culture - Organisational structure
CSF5 – Effectiveness of inter-organisational communications	- Formal reporting systems - Clear accountability - Improving communication flow processes

As outlined, there is more flow to the corresponding goals than appear in the DMCA framework. While the outline is to clarify the corresponding goals of each CSF, it also indicates how the corresponding goals may be followed and implemented as a process that leads to disaster resilience. The outline shows that integrated planning needs to be achieved first, then education about disaster preparedness and on to all the corresponding goals in CSF1, CSF2, CSF3, CSF4 and the last corresponding goal in CSF5 which is improving communication flow process. It is by achieving integrated planning which is a process where all organisations responsible for disaster response work together in a cohesive and cooperative manner that communication flow processes may be improved.

The explanations in chapter two (Table 2.2) which summarises the best practice in capacity assessment from the countries examined, emphasise that capacity assessment needs include essential features including structured approach (by the UN) and comprehensive to cover all phases (Japan) and indicators that show performance (Taiwan). The performance indicators in the case of the DMCA framework is linked to ability to achieve good and effective communication flow processes. To further understand this and the relationship between the CSFs and corresponding goals outlined in this section, next chapter focuses on validation of the DMCA framework and its functionality and potential effectiveness in KSA.

5.4. CHAPTER SUMMARY

This chapter has presented and analysed the need for disaster response capacity assessment framework. The methodologies for disaster response capacity assessment were identified and analysed, which led to the prioritization of CSFs for DRCA framework and methods used for prioritizing and assessing the CSFs. The priority ranking results paved way for the five CSFs selected from the fifteen factors identified from the literature review. Achieving this in this chapter is key to achieving the research objectives which then leads to the process for achieving the aim of this research. While the DRCA framework layers were also important in arriving at an objective process for selecting and prioritizing the CSFs for DRCA framework, identifying the corresponding goals for each CSF was also important aspect of this chapter which led to determining the building blocks of DRCA framework and subsequently in developing the DMCA framework. The outline for the DMCA framework further shows the flow of necessary goals that need to be achieved from the first CSF to the fifth CSF. This establishes the relationship between the CSFs and their corresponding goals, and the interactions that need to take place for disaster resilience to be attainable. Based on the outcome of this chapter, the next chapter validates the DMCA framework which is important in achieving the overall research aim.

Chapter 6 DISASTER RESPONSE CAPACITY ASSESSMENT (DRCA) FRAMEWORK VALIDATION

6.1. CHAPTER INTRODUCTION

This chapter presents initial findings from data collection and framework development process. As a result of literature review, a set of critical success factors were identified. This section presents prioritisation of identified success factors using Multi Criteria Decision Making methods. It describes the research undertaken to meet the aim and objectives of the research and highlights the main initial results. This section illustrates key aspects of disaster management capacity framework. It includes five key critical success factors (i.e. a: Enhancing Community Engagement, b: Effective Response and Recovery Planning: c: Training of First Responders; d: Effectiveness of Inter- Organisational Structure; e: Effectiveness of Intra Organisational Communications) and sub factors (referred to as Key Performance Indicators) included within each element. The framework guides the development and implementation of capacity assessment at both national and local government level, with a view to enhance disaster response capabilities. Framework can serve as a strategic benchmark against which reporting and evaluation of outcomes can be undertaken. The five strategic elements were identified based on analysis presented in Section 5.3. Figure 5-10 provides a general description of key strategic areas and details that are included within each area.

6.2. CASE STUDY VALIDATION – RIYADH REGION

DRCA framework, as developed and presented in Chapter 5, was validated by its implementation within Riyadh region. Set of KPIs corresponding to key factors within DRCA framework was defined in previous chapter. Data was obtained against those KPIs to provide a quantitative basis for discussion, alongside qualitative data capture. Riyadh is capital and largest city of Saudi Arabia and also, capital of Riyadh province. Riyadh city is divided into 15 municipal districts and has a population of 5.7 million people. It has faced major disaster/emergencies in recent years, including bombings in 2003 and floods in 2005, which left 700 people homeless. 2010 floods in Riyadh caused 275 car crashes. Riyadh Bombing in 2003 included terrorist attack on housing compound. In the attack, 34 people were killed and 194 injured. Also, in 2004, within a short span of 4 months, region was struck by 2 floods within Jizan region. Floods lead to 13 causalities; 400 people being left homeless and devastation of public utilities.

6.2.1 Demographics of Participants in DRCA Validation Process

This Section presents the demographic information of the interviewees who participated in the validation process.

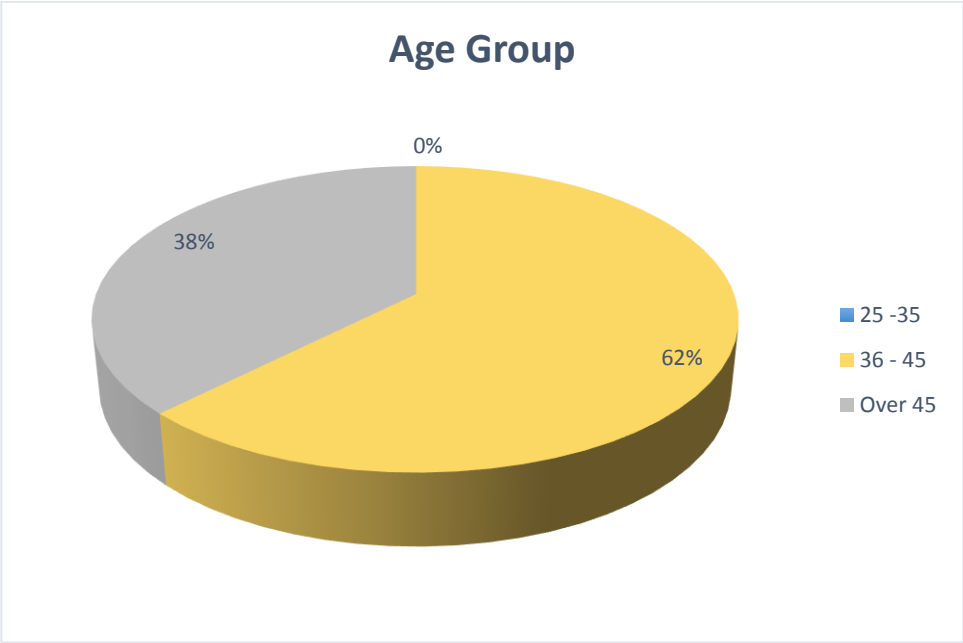

Figure 6-1: Age Group of Interviewees

The age range as shown in Figure 6.1 demonstrates that participants were mature professionals and that they have potential, skills, ability and experience to understand the topic the questions being asked and topic being discussed. All interviewees were senior officials within Ministry of Interior, KSA. All participants worked in Riyadh region; however, they have experiences of working elsewhere in KSA. This wide spread engagement provides an objective and balanced views of disaster management operations in Saudi Arabia and coverage of varied perspectives. Other demographic information is illustrated in Table 6.1.

Table 6-1: Demographic information of participants

Participants	Work area	Rank	Education level
A1	Civil Defence	Colonel	Master
A2	Ministry of Interior	Brigadier	Master
A3	Civil Defence	Colonel	PhD
A4	Civil Defence	Colonel	PhD
A5	Civil Defence	Colonel	PhD
A6	Ministry of Interior	Colonel	PhD
A7	Ministry of Interior	Colonel	Bachelor
A8	Ministry of Interior	Brigadier general	PhD

It can be observed that the eight experts who were interviewed were high ranking officials with high level academic qualifications, except for two people who wanted to keep their rank and level of education confidential. In terms of participation in programs relating to disaster and crisis management, six out of the eight participants claimed to have been involved in several disaster and crisis related programs. The graphical representation of their responses is presented in Figure 5.9 to indicate and justify their level of expertise.

The data in Figure 6.2 represents the extended participation of the experts in disaster and crisis programs. This infer that their participation in many disaster and crisis programs indicate their level of expertise and vast knowledge about the subject area and operational procedure in Saudi Arabia. The eight experts confirmed the following categories as the nature of disaster and crisis management programs joined:

- Dealing with natural disasters
- Dealing with industrial disasters
- Dealing with disasters caused by people

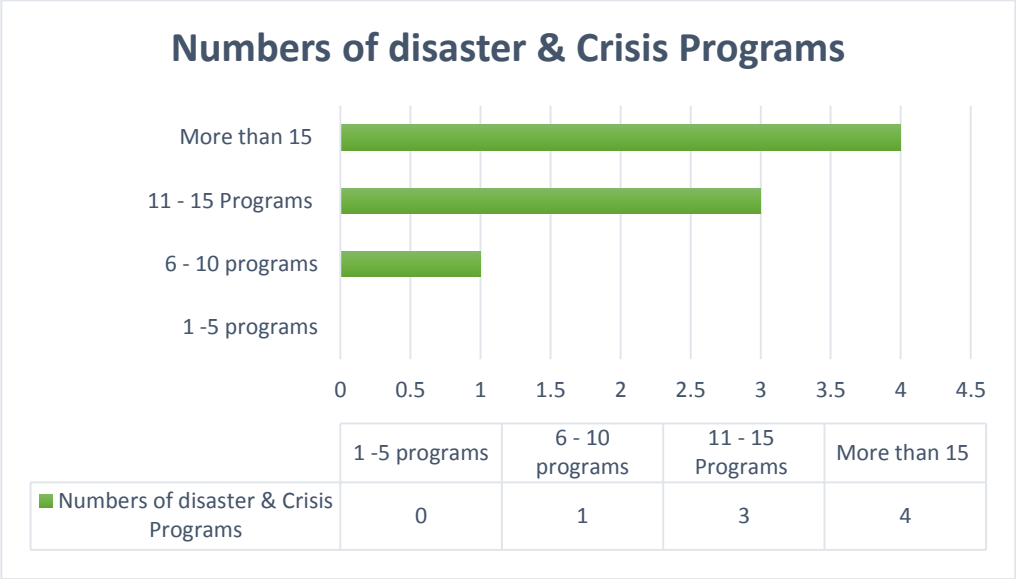

Figure 6-2: Numbers of disasters attended & Crisis programs joined

Past involvement of the eight interviewees in these categories of programs relating to disasters and crisis further justifies them as experts in this field of study and as ones who are able to contribute objectively to the study area. The next section focuses on presenting and analysing the research results from the validation process with the eight experts.

For each KPI, respondents were prompted to score their disaster response readiness at various levels such as 0% (absent), 20%, 40%, 60%, 80%, 100%. Participants were instructed that in case of Not applicable option, they could leave the field blank, where a particular KPI was not relevant to a specific context. All KPIs were of equal weighting. All 8 participants participated in a focus group. Focus group participants were asked to assess the organisational readiness using DRCA framework. The quantitative data captured was backed by interviews conducted with same personnel attending the DRCA Evaluation. This allowed for triangulation of data and fair assessment of disaster response organization strengths and weaknesses. Evaluation revealed certain areas of strengths and weaknesses.

6.2.2. Evaluation of CSF 1 – Enhancing Community Awareness and Engagement

This section evaluates the CSF1 for strengths and weaknesses in order to validate its corresponding goals towards achieving disaster resilience.

Table 6-2: CSF 1 – Goal 1 Data from Riyadh Case Study

#	Goals	#	Performance Measures	NO (0%)	20% (Some Progress)	40% (Average Progress)	60% (Good Progress)	80% (Very Good	YES (100%) (Achieved)	KPI MESURE	Weight Ratio	Weighted Score
1	Achieve Integrated Planning	1	We have a holistic approach to disaster planning across the organisation	X						0	25.0 %	0
		2	We ensure policy, planning and regulatory processes are driven to ensure effective disaster management			X				40	25.0 %	10
		3	We seek input from police, fire, civil defence and Health in planning process		X					20	25.0 %	5
		4	We have structures in place to ensure multi-agency integrated planning	X						0	25.0 %	0
	TOTAL WEIGHTED GOAL SCORE											15

Table 6-3: CSF 1 – Goal 2-5 Data from Riyadh Case Study

#	Goals	#	Performance Measures	NO (0%) Absent	20% (Some Progress)	40% (Average Progress)	60% (Good Progress)	80% (Very Good Progress)	YES (100%) (Achieved)	KPI MESURE	Weight Ratio	Weighted Score
2	Public Education about disaster preparedness	1	We have a public education programme approved by senior management			X				40	25.0%	10
		2	We have budget allocation for Public Education						X	100	25.0%	25
		3	We have assigned managers for public education						X	100	25.0%	25
		4	We continuously review effectiveness of our public engagement programmes		X					20	25.0%	5
	TOTAL WEIGHTED GOAL SCORE					**=**		**65**				
3	Enhancing Community Resilience	1	We collaborate with local schools/establishments to promote disaster/risk reduction			X				40	25.0%	10
		2	We promote disaster awareness in local/community events						X	100	25.0%	25
		3	We seek input from communities in preparing for disasters						X	100	25.0%	25
		4	We have processes in place to manage public queries		X					20	25.0%	5
		TOTAL WEIGHTED GOAL SCORE					**= 65**					

		#	Performance Measures	NO (0%)	20% (Some Progress)	40% (Average Progress)	60% (Good Progress)	80% (Very Good	YES (100%) (Achieved)	KPI MESURE	Weight Ratio	Weighted Score
4	Media / Public Relations	1	We engage proactively with media in disaster preparedness and response		x					20	25.0 %	5
		2	We have trained staff to engage with media		x					20	25.0 %	5
		3	We have prepared media statement templates specific to different emergencies	x						0	25.0 %	0
		4	We use social media (Twitter, Internet) to provide up to date information to public	x						0	25.0 %	0
			TOTAL WEIGHTED GOAL SCORE = 10									
#	Goals	#	Performance Measures	NO (0%)	20% (Some Progress)	40% (Average Progress)	60% (Good Progress)	80% (Very Good Progress)	YES (100%) (Achieved)	KPI MESURE	Weight Ratio	Weighted Score
5	Support for Volunteer Participation	1	We have clearly defined roles and responsibilities to manage volunteers	x						0	50.0 %	0
		2	We have enough volunteers to support disaster response efforts		x					20	50.0 %	10
			TOTAL WEIGHTED GOAL SCORE = 10									

Focus group participants talked about use of Internet and websites to engage with public, however, they expressed the concern that it is not well developed and not very effective. Given multi-lingual nature of Riyadh population, concern was raised about effectiveness of various public education initiatives and lack of monitoring to evaluate efficacy of various investments. Various initiatives to enhance community resilience such as engagement with local schools was highlighted, however, it

was mentioned that there is no robust mechanism in place to monitor effectiveness of these initiatives. It was mentioned that there is dedicated staff with some public resource allocation to support public engagement. Summary of key responses obtained is presented in radar chart in Figure 6.3.

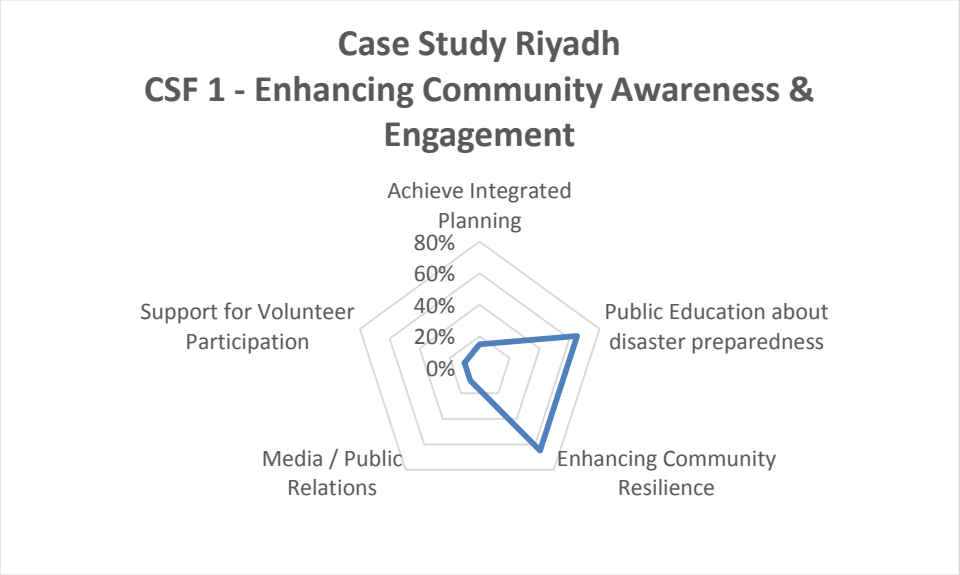

Figure 6-3: Radar chart of Quantitative Data Obtained Related to CSF 1

The assessment and validations for this CSF shows that while the CSF is relevant to achieving the overall goal of disaster resilience, there are factors like lack of robust mechanisms to monitor effectiveness of the CSF1 within the KSA system that may prevent this from being achieved. The next CSF is validated in the next section.

6.2.3. Evaluation of CSF 2 Effective Response and Recovery Planning

The findings from evaluating CSF1 also makes this section important in evaluating the corresponding goals of CSF2.

Table 6-4: CSF 2 – Goal 1-3 Data from Riyadh Case Study

#	Goals	#	Performance Measures	NO (0%)	20%	40%	60%	80%	YES (100%)	SCORE	Weight Ratio	Weighted Score
1	Goal 1 - Proactive Disaster Risk Reduction Strategies	1	We have detailed maps (e.g. GIS) to identify potential hazard areas	X						0	50.0%	0
		2	We regularly undertake risk assessments and analysis of key risks within our jurisdiction		X					20	50.0%	10
TOTAL WEIGHTED GOAL SCORE = 10												
#	Goals	#	Performance Measures	NO (0%)	20%	40%	60%	80%	YES (100%)	SCORE	Weight Ratio	Weighted Score
2	Goal 2- Better Understanding of Disasters	1	We actively support research to better plan disaster planning and management	X						0	25.0%	0
		2	We have good understanding of existing disaster risks within our region				X			60	25.0%	15
		3	We regularly arrange/attend conferences/workshops to ensure awareness of best practice			X				40	25.0%	10
		4	We engage with Engineers and technical specialists to seek technical advice				X			60	25.0%	15
		TOTAL WEIGHTED GOAL SCORE = 40										

Table 6-5: CSF 2 – Goal 1-3 Data from Riyadh Case Study (Contd.)

#	Goals	#	Performance Measures	NO (0%)	20%	40%	60%	80%	YES (100%)	SCORE	Weight Ratio	Weighted Score
3	Goal 3 - Increased co-ordination between agencies involved	1	We have processes in place to warn partner agencies and stakeholders			X				40	20%	8
		2	We can deploy additional ad-hoc communication system to support disaster response efforts		X					20	20%	4
		3	There is protocol of communication between different agencies e.g. radio frequency, channels			X				40	20%	8
		4	We test communication medium on a regular basis.						X	100	20%	20
		5	Process of escalation of state of emergency is clear.						X	100	20%	20
		TOTAL WEIGHTED GOAL SCORE = 40										

Some of the key points discussed during focus group discussions on CSF 2 included:

- Need to maintain a central repository which is easily accessible and contain up to date hazard and risk register in an easy to use format such as an overlay on Google Earth.
- Working closely with key stakeholders such as utility companies, to develop a comprehensive way of identification of risks and responsibilities. At the moment, there is no consistent way to produce a risk register. Even though in cases where these risks are identified, they are not easily accessible.
- Easy mechanisms for sharing risk information need to be identified.

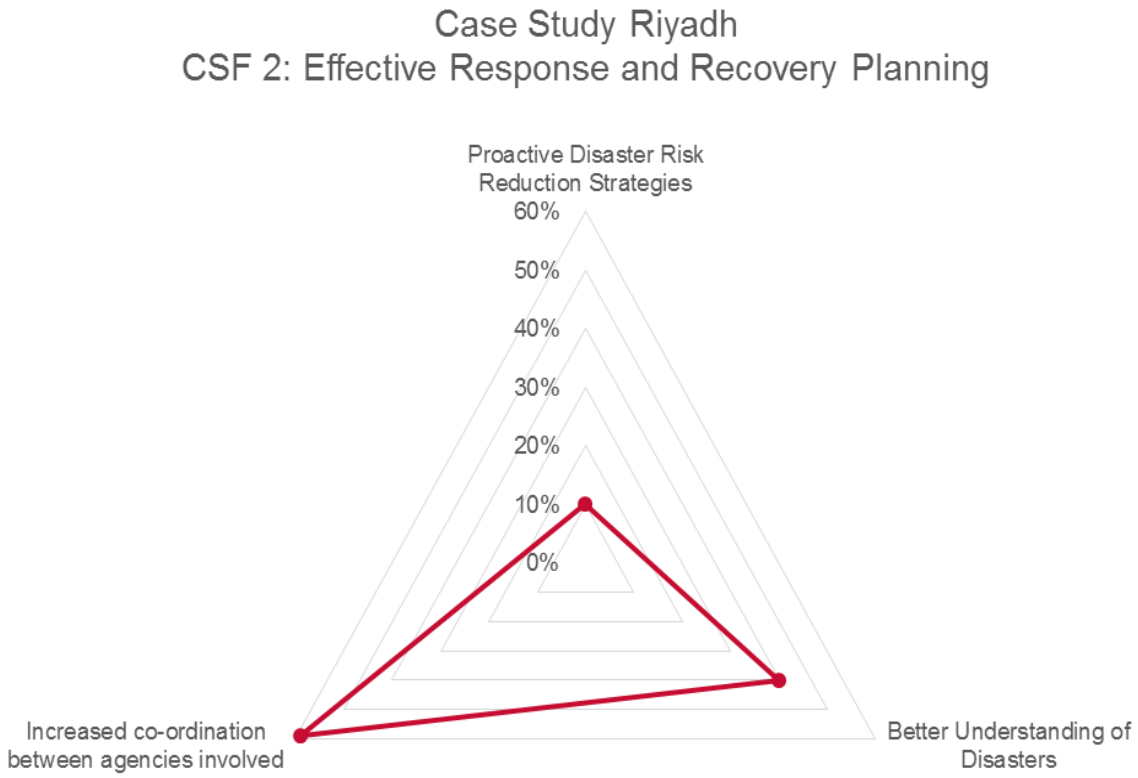

Figure 6-4: Radar chart of Quantitative Data Obtained Related to CSF 2

The radar chart shows the quantitative data obtained related to CSF2. While there is relationship between the corresponding goals, there is need for easy mechanisms for sharing risk information.

6.2.4. Evaluation of CSF 3 Educational Training Programmes

This section evaluates CSF3 which is the educational training programmes and responses provided for the validation of the CSF.

Table 6-6: CSF 3 – Goal 1-3 Data from Riyadh Case Study

#	Goals	#	Performance Measures	NO (0%)	20%	40%	60%	80%	YES (100%)	SCORE	Weight Ratio	Weighted Score
1	Goal 1 - Education and Training Programmes for Disaster Responders	1	We allocate resources for staff training					X		80	50.0%	40
		2	We co-ordinate with police, medicine and engineering in professional development	X						0	50.0%	0
		TOTAL WEIGHTED GOAL SCORE = 40										
#	Goals	#	Performance Measures	NO (0%)	20%	40%	60%	80%	YES (100%)	SCORE	Weight Ratio	Weighted Score
2	Goal 2 - Continuous Professional Development of Disaster/ Emergency Responders	1	We have Professional Development strategy aligned to Interior Ministry Goals			X				40	50.0%	20
		2	We undertake development analysis to understand need for professional development		X					20	50.0%	10
		TOTAL WEIGHTED GOAL SCORE = 30										

Table 6-7: CSF 3 – Goal 1-3 Data from Riyadh Case Study (Contd.)

#	Goals	#	Performance Measures	NO (0%)	20%	40%	60%	80%	YES (100%)	SCORE	Weight Ratio	Weighted Score
3	Goal 3 - Regular Disaster Drills	1	We regularly undertake disaster drills			X				40	50.0%	20
		2	**We have standard written down operating processes for undertaking disaster drills**	X						0	50.0%	0
		TOTAL WEIGHTED GOAL SCORE = 20										

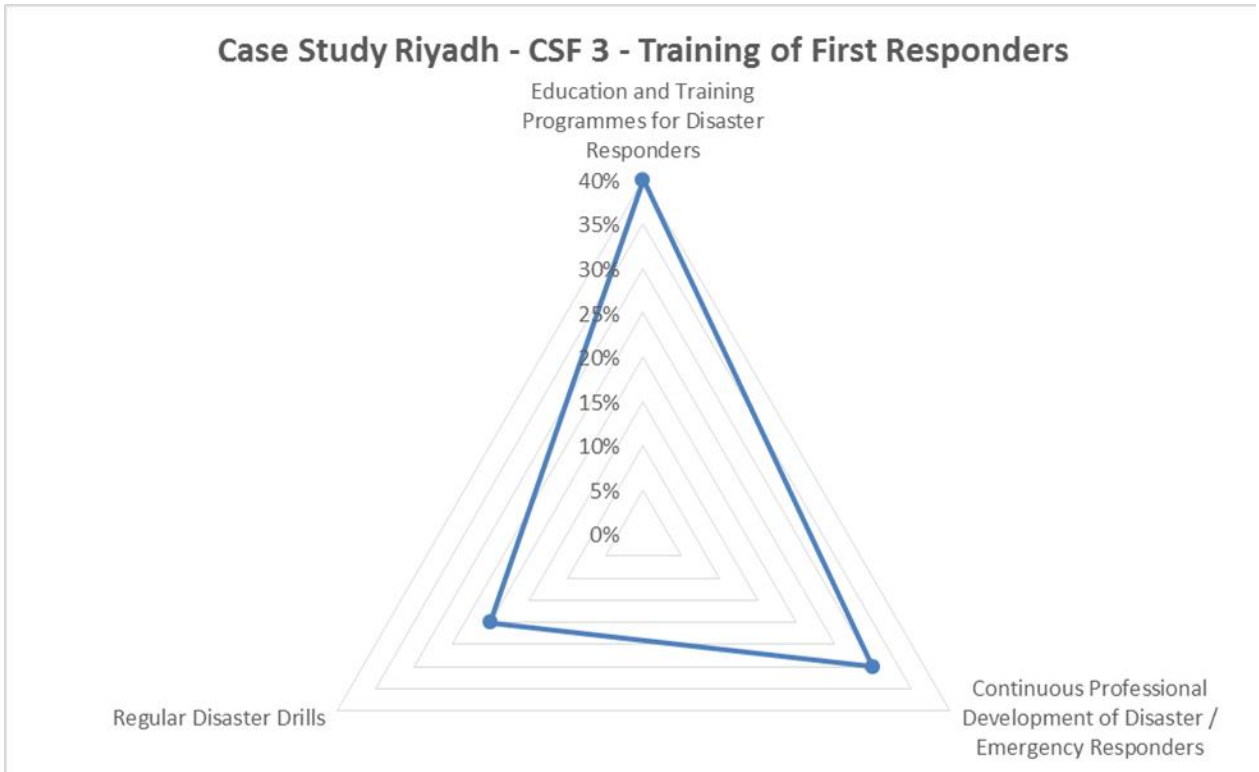

Figure 6-5: Radar chart of Quantitative Data Obtained Related to CSF 3

6.2.5. Evaluation of CSF 4 Inter-Organisational Structure

Like CSF 3, CSF 4 also have 3 corresponding goals that need to be achieved in order to arrive at inter-organisational structure that is capable of responding effectively to disaster. Table 6.6 shows the three goals and performance measures.

Table 6-8: CSF 4 – Goal 1-3 Data from Riyadh Case Study

#	Goals	#	Performance Measures	NO (0%)	20%	40%	60%	80%	YES (100%)	SCORE	Weight Ratio	Weighted Score
1	Goal 1 - Business Continuity	1	We maintain a directory of local contractors to support us in disaster response (e.g. emergency power supply, cranes, heavy equipment, etc.)			X				40	20%	8
		2	We know where we can acquire critical resources in times of major disaster			X				40	20%	8
		3	Financial arrangements are in place to acquire resources at times of disaster					x		80	20%	16
		4	We have structured approach to disaster needs assessment		X					20	20%	4
		5	Business Continuity plan is in place with clearly defined objectives		X					20	20%	4
	TOTAL WEIGHTED GOAL SCORE = 40											

Table 6-9: CSF 4 – Goal 1-3 Data from Riyadh Case Study (cond.)

#	Goals	#	Performance Measures	NO (0%)	20%	40%	60%	80%	YES (100%)	SCORE	Weight Ratio	Weighted Score
2	Goal 2 – Culture to promote good practices in disaster response	1	There is culture to promote good practices in disaster response within interior ministry and partner agencies			X				40	50.0%	20
		2	We have a Continuous Improvement Culture where we continually ask how well we have been doing and areas of improvement			X				40	50.0%	20
	TOTAL WEIGHTED GOAL SCORE = 40											
#	Goals	#	Performance Measures	NO (0%)	20%	40%	60%	80%	YES (100%)	SCORE	Weight Ratio	Weighted Score
3	Goal 3 - Organisational Structure	1	We have a good governance structure to cope with major disasters			X				40	50.0%	20
		2	Roles and responsibilities of all involved agencies and stakeholders are clearly defined				x			60	50.0%	30

		TOTAL WEIGHTED GOAL SCORE	**= 50**

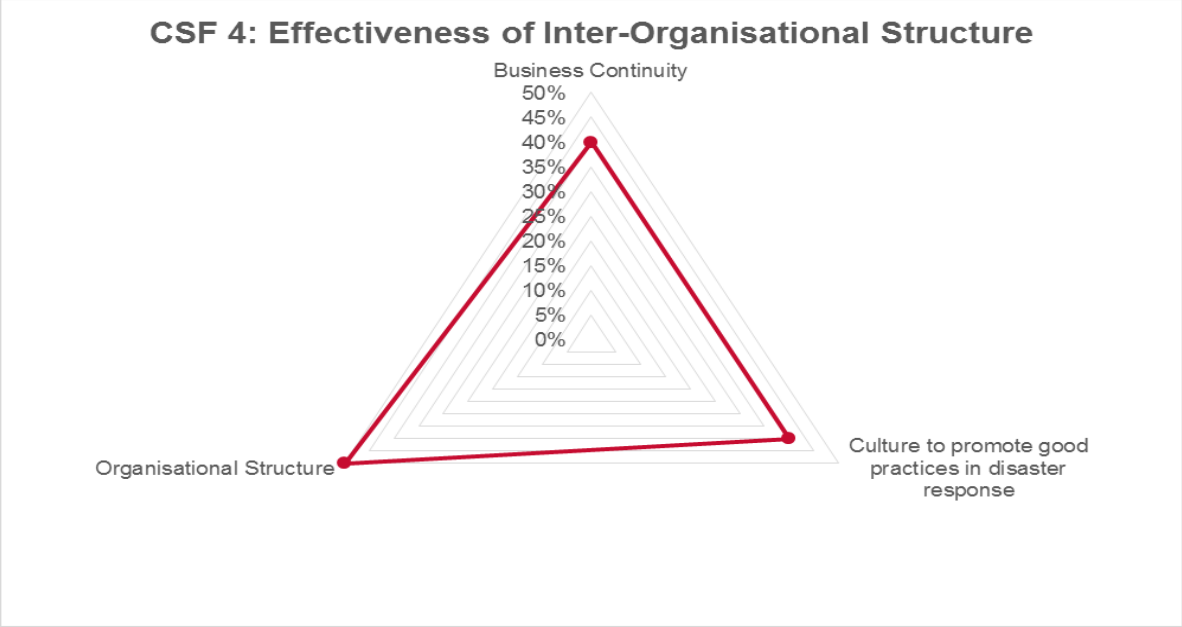

Figure 6-6: Radar chart of Quantitative Data Obtained Related to CSF 4

6.2.6. Evaluation of CSF 5 Effectiveness of Inter Organisational Communications

This section evaluates CSF5 which relates to effectiveness of inter organisational communications and its corresponding goals.

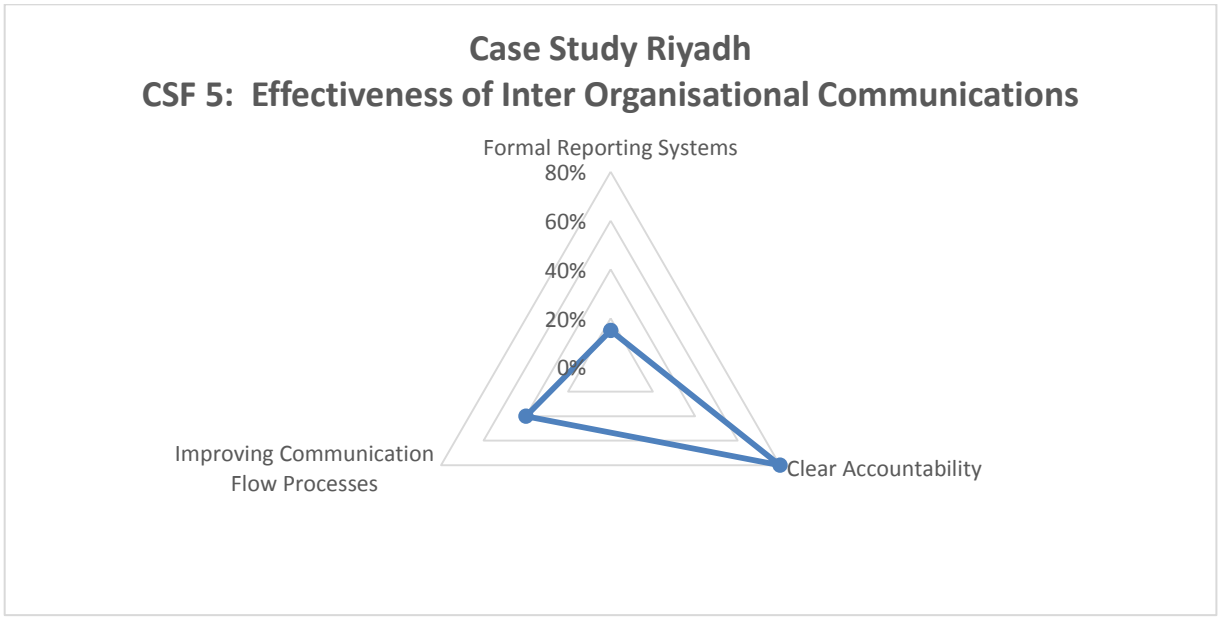

Figure 6-7: Radar chart of Quantitative Data Obtained Related to CSF 5

Table 6-10: CSF 5 – Goal 1-3 Data from Riyadh Case Study

#	Goals	#	Performance Measures	NO (0%)	20%	40%	60%	80%	YES (100%)	SCORE	Weight Ratio	Weighted Score
1	Goal 1 - Formal Reporting Systems	1	We have a standardize process of impact assessment	X						0	50.0 %	0
		2	We have a process in place to identify resources needed for response			X				40	50.0 %	20
	TOTAL WEIGHTED GOAL SCORE = 20											

#	Goals	#	Performance Measures	NO (0%)	20%	40%	60%	80%	YES (100%)	SCORE	Weight Ratio	Weighted Score
2	Goal 2 - Clear Accountability	1	There is good management process in place to ensure transparency and accountability					X		80	50.0 %	40
		2.	Adequate processes are in place to ensure personal accountability					X		80	50.0 %	40
	TOTAL WEIGHTED GOAL SCORE = 80											
#	Goals	#	Performance Measures	NO (0%)	20%	40%	60%	80%	YES (100%)	SCORE	Weight Ratio	Weighted Score
3	Goal 3 : Improving Communication Flow Processes	1	We have effective processes for communications within Interior Ministry and with other agencies			X				40	33.3 %	13
		2	We have communication protocols while dealing with emergencies and disasters			x				40	33.3 %	13

		3	We regularly evaluate effectiveness of communicatio n processes			X				40	33.3 %	13
		TOTAL WEIGHTED GOAL SCORE = 39										

Summary of results from assessment are shown in a spider diagram (Fig 6.8), which gives a summary overview of areas of strength and weaknesses of an organizational disaster response readiness. The scales on the radar chart vary from 0 to 100%, with outer boarders (80% +) indicating organisational maturity in achieving a particular KPI. Various KPIs are graphically connected indicating performance results. Inner circles within Radar chart indicate lower or average performance. The radar shows that clear accountability has high percentage, other factors that relate to increasing capacity are mentioned, but with limited understanding and knowledge of them. This suggests further need for knowledge increase through training that focus on educating about capacity assessment and its potential to improve capability for response. The low understanding of capacity assessment informs the need for a roadmap for implementing the application especially in a place like Riyadh.

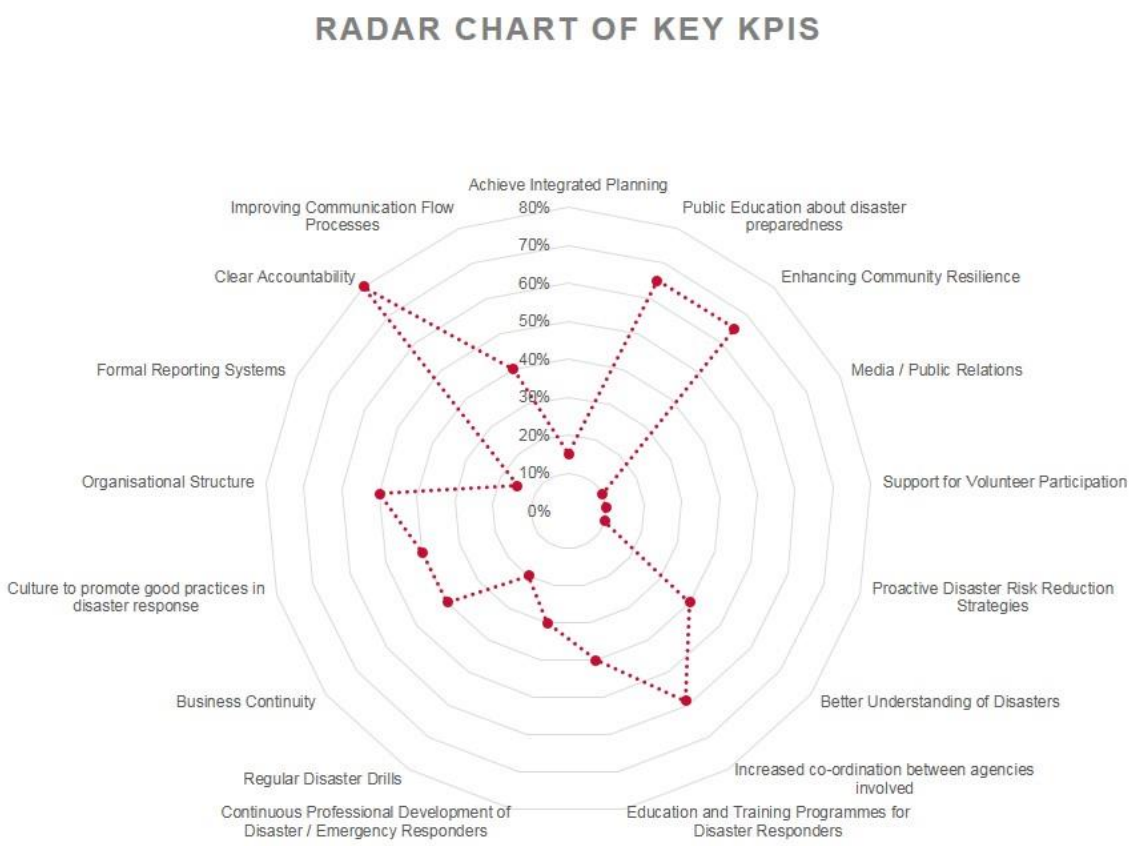

Figure 6-8: Spider Diagram representation of key KPIs

6.3. EVALUATION OF EFFECTIVENESS OF DCRA FRAMEWORK

Even though in presented analysis of effectiveness of DCRA framework, a cross sectional view was taken and two major regions are evaluated at given snap shots of time. However, it is envisaged that the proposed framework will be implemented in a continual basis, allowing for organizational learning to take place. Need for DRCA framework is important for number of reasons including:

- To allow for monitoring readiness of regional Civil Defence organizations to face different types of natural and man-made disasters
- Building capacity and capability of disaster response operations
- To allow for continuous measurement, to allow for effective monitoring and control

- To allow for a quantified metrics that can be used to assess readiness
- To provide stakeholders with an idea where disaster response organization is lacking in a specific area and to provide a metrics for key decisions e.g. allocation of resources using informed decision making
- To allow for organizational reflection i.e. encouraging teams to look into key areas of disaster readiness and document organizational endeavours in this respect
- Allowing for accountability i.e. Governmental investment vs disaster response organizational readiness
- Allowing for reporting in a consistent format
- Allowing for internal evaluations/audits without the need for external audits which are quite expensive

Participants thought there is real opportunity to enhance existing skill level. There are number of training programmes being initiated by Civil Defense, which is seen as helping achieve the goal of skills enhancement. Need to make the most use innovative technologies in responding to disasters were identified. Many interviewees revealed the need to improve co-ordination between Civil Defense and Ministry of Interior. Respondents were confident in ability of Civil Defence and Ministry of Interior in managing small scale disasters. However, in responding to large scale disasters, there was a mixed view.

Respondents identified importance of strong leadership and commitment for a good top down communication. Need for strong collaboration with private sector and volunteer organisations was also identified, alongside need to delegate powers at local level and better co-ordination with private sector is identified. Various potential risks or challenges to uptake of DRCA Framework were also highlighted including:

- Absence of an evaluative culture within KSA. Every day management is usually not very quantitative driven and implementation of such a framework requires a culture where outcomes are continuously recorded in an empirical format and benefits of various interventions are quantified. It also requires ability to challenge status-quo where organization is in continuous search of reflective questions such as how can we improve on previous performance, where are opportunities for future growth etc.

- “DRCA framework is quite generic and will not be so effective in certain cases”. This was a valid comment however; objective of DRCA framework was to demonstrate initial idea and proof of concept. It is possible for various organizations to include elements more specific to their context.

Although five CSFs were identified as priority for building capacity for disaster response, it is possible that different regions may have different priorities or priorities change over time. Thus, the approach presented for implementation includes a suggestion to include flexibility to change CSFs based on changing global best practice or internal organisational dynamics. In addition to this, a section that focus on addressing challenges and their impacts is also included to ensure that current challenges are dealt with, and that understanding and arrangements are in place to deal with future challenges. Figure 6.9 which contains four stages, captures aspects of objective one, two and three so that the framework can be more effective than the adopted methodologies from the UN and other developed countries.

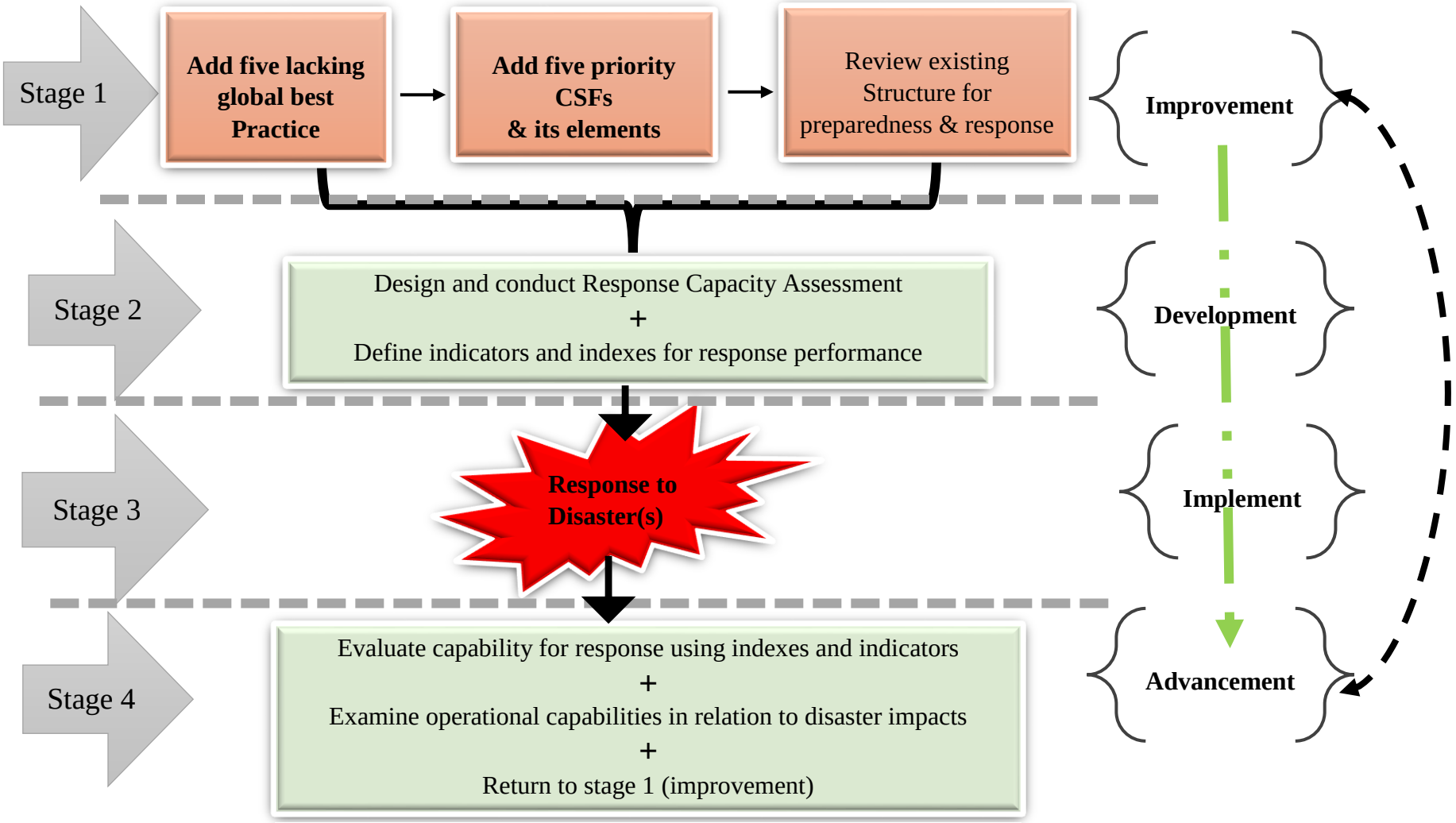

Figure 6-9: Flexible approach to enhance organisational capability

Figure 6.9 has four stages; improvement, development, implement and advancement. These stages all have components and actions plans that need to be conducted in order for the framework to translate into effective response for any disaster size and type. The framework also has green broken arrow, black broken arrow and black thick arrow and black thin arrow, all which have significance in using the framework as a road map for capacity assessment and development of disaster preparedness and response capabilities. All these arrows are explained and their functions discussed within the stages inputted in the framework as follows:

Stage 1 (Improvement): this stage is critical, not because it is the first stage, but because it contains three main components that aims to improve existing structure in KSA without disrupting the existing structure. This stage bears in mind the good practice in the existing structure, but shows that the lacking global best practice and five CSFs and their elements are integrated into existing structure. This stage also includes black thin arrows between each component to encourage integration between all activities, actions and components. It is expected that this stage will simultaneously improve the existing structure and directly and indirectly address gaps such as lack of five global best practice, and lack of communication and problems with other CSFs identified during this research inquiry. Stage 1 needs to focus directly on improving, and where necessary develop elements of CSF1, CSF2, CSF3, CSF4 and CSF5. However, it is important to state that in order to integrate these two components with existing structure, it is necessary to review existing structures so that the appropriate manner in which the stage can operate can be determined. This process will complete the integration process for this stage.

Stage 2 (Development): this stage sees to it that the KSA structure is being developed to appropriately conduct response capacity assessment (Figure 6.9) for enhancing preparedness and response arrangements for confronting disasters. This stage has a component, but with two action plan that are interlinked. This stage can be likened to a test-run process for the previous stage where improvement have been made to the existing structure. It is a stage where all elements of CSF1, CSF2, CSF3, CSF4 and CSF5 need to be reviewed and assessed in relation to risks in KSA, so that appropriate capabilities are developed.

This stage require that a suitable response capacity assessment is designed and conducted to determine whether methodologies and approaches in place are sufficient for dealing with any size and type of disasters. The stage also requires that indicators that fit the KSA system are defined and indexes that can help evaluate response performance are clarified. Indicators should also influence training design and past disasters used as scenarios for testing response arrangement so that better preparedness can be done. This stage is key for stage 4 which is the stage where evaluation is conducted to determine how response was carried out and the level of response performance.

Stage 3 (Implement): this stage is actual response to disaster of any size and type, where all that has been improved and developed are put to use by all organisations involved in response. Completing incident report in relation to indicators is very important at this stage, so that actual response performance can be evaluated promptly before another disaster occurs. This is because the case study chapter indicated that flooding and other disasters occurred within months apart when recovery of the past disaster was still ongoing. Therefore, it is important that indicators that can be evaluated to determine areas where response performance can be improved is strategic to business continuity arrangements (which is under CSF4), advancing to another disaster response and to returning to the improvement stage. Here all the elements with CSF2 and CSF5 need to be put to use.

Stage 4 (Advancement): this stage requires three different, but related activities. First, there is need to evaluate capability for response using the indicators and indexes that were defined in stage 3. This is important in order to determine the effectiveness of the capability that had been developed in stage 1 and the training conducted in stage 2 for response in stage 3. Second, the operational capabilities such as equipment, procedures, communication and coordination between agencies (essentially to evaluate the CSF2) need to be examined in relation to the disaster impacts. It is also helpful at this stage to re-assess elements of CSF1 to determine the extent of community engagement prior to, during and in the immediate aftermath of the disaster. Lastly, stage 4 need to advance from this stage to stage 1 in order to improve areas that suffered limitations or were deficient in operational terms.

Due to the gaps and results of this study, the framework (Figure 6.9) is recommended as a guide for improving, developing, monitoring and evaluating the disaster management system in KSA so that response to disasters can be more effective. However, this framework is not recommended in vacuum without experts in Saudi validating components of the first stage which has influenced other stages of the framework.

6.4. QUALITATIVE DATA CAPTURED DURING FRAMEWORK VALIDATION

The focus group discussion was used to validate the stage that influenced the other stages of the framework. This is because references were made to elements that have been included in stages 2, 3 and 4. Therefore, to avoid repetition, emphasis was placed on stage 1 which includes two new components. In reaction to the addition of two components to the Saudi structure, experts stated that CSFs as important and relevant to KSA system, and that best practice is also being used, but not really applicable to Saudi context in different ways. This is because best practice is not developed with Saudi environment in mind, but general that can be applied anywhere. Therefore, it was emphasise that any addition that will be used should have criteria that were analysed using Nvivo software. The result is illustrated in the mind map.

According to the experts, best practice within the framework must teach disaster response arrangements that covers actions for "before, during and after" of response. Framework need to be effective enough to prevent and/mitigate risks in Saudi Arabia, and application to Saudi environment is key and understandable. There are also the criteria for improving communications between organisations and stakeholders, and to provide means for determining performance and bad practice that needs to be improved. In addition to this, CSFs specifically in the framework needed to provide good planning based on risk identified, training and development for responders to deal with disasters, and arrangement for quick recovery (business continuity). Better communication between community and organisations, as well as empowering community and educating them on disaster issues were also assessed as relevant and prone to contribute to the effectiveness of the framework.

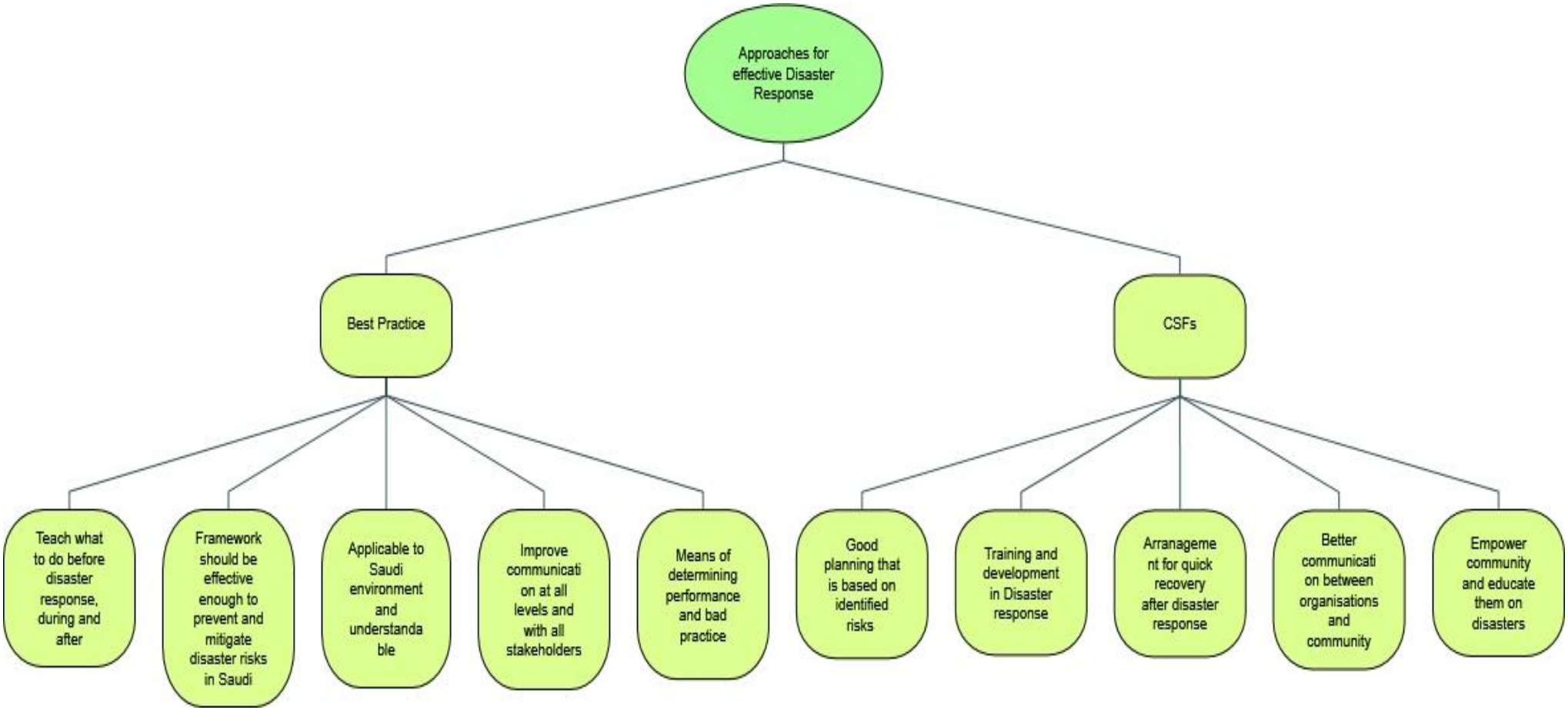

Figure 6-10: Criteria for components of framework and validation

The criteria emphasised by the experts were used as guide to review the framework to arrive at Figure 6.10. This is because the components of the framework were validated and then developed based on the input of the expert to ensure that there is stakeholder contribution to the development of the framework and arrangements. The rationale for this is to develop a framework that is more likely to be accepted and adopted for use in Saudi, than to develop a framework that does not include any input from the end-user, which is based on the explanations by Shuhei (2014), Alexander (2005), Canton (2007) and Dillion et al. (2009). Regardless of this input, the next section outlines the roadmap for applying the framework in KSA.

The situation is also similar in Riyadh region which is the capital and largest city in Saudi Arabia. The city is divided into 15 municipal districts and has a population of 5.7 million people. It has faced major disaster/emergencies in recent years, including bombings in 2003 and floods in 2005 which left 700 people homeless. 2010 floods in Riyadh caused 275 car crashes. To undertake a capacity assessment of Riyadh region, framework components were discussed with 3 officials from Riyadh region. Salient points discussed during focus group sessions are as follows:

1) There is real opportunity to enhance existing skill level. There are number of training programmes being initiated by Civil Defense, which is seen as helping achieve the goal of skills enhancement.
2) There is need to make the most use innovative technologies in responding to disasters.
3) Many interviewees revealed the need to improve co-ordination between Civil Defense and Ministry of Interior.
4) Respondents were confident in ability of Civil Defence and Ministry of Interior in managing small scale disasters. However, in responding to large scale disasters, there was a mixed view.
5) Respondents identified importance of strong leadership and commitment for a good top down communication.
6) Need for strong collaboration with private sector and volunteer organisations was identified.
7) Need to delegate powers at local level and better co-ordination with private sector is identified.

Set of KPIs corresponding to key strands of framework were defined. Data was obtained against those KPIs to provide a quantitative basis for discussion.

6.5. ANALYSIS OF INTERVIEW RESULTS

The qualitative data obtained from the interviewees was analysed using Nvivo software to determine the emphasises on words or themes related to this objective. Since this section relates to the first objective, themes such as capacity assessment and methodologies were used as criteria for the search, with the aim of determining the status of assessment methods used in KSA. The text search query result indicates that data on capacity assessment in Saudi has only 67 references in the eight sessions and a received a coverage of 5.30%. The word tree shows that the understanding and application of capacity assessment is based around words such as actions, abilities, individuals in charge and operations.

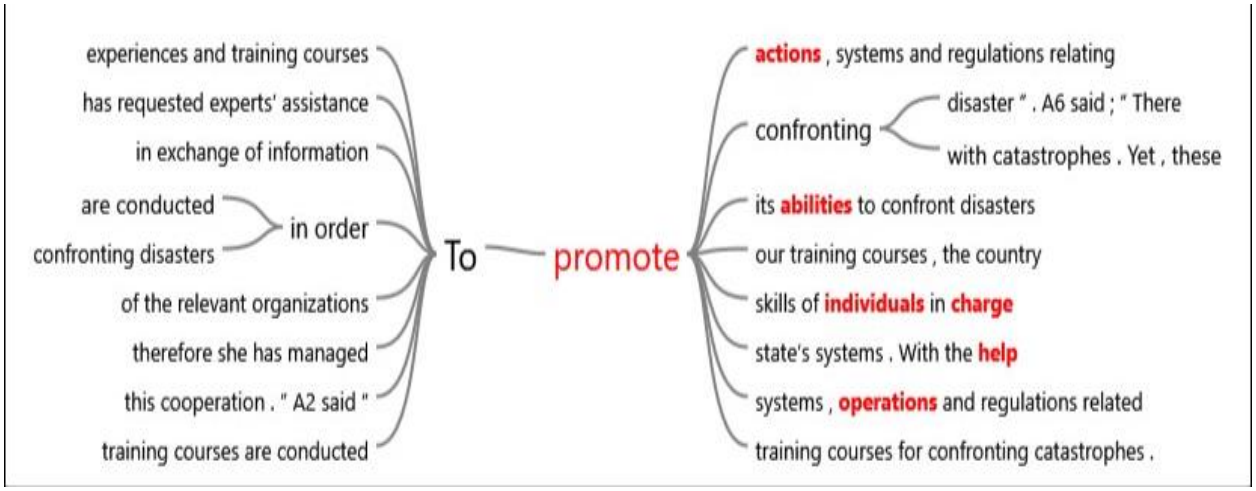

Figure 6-11: Text Query for Capacity Assessment

The result in Figure 6.11 shows that capacity assessment for building capacity for response is mostly done through training courses or experiences gathered through actions, systems and regulations. As seen in the figure, emphasises were also around abilities of relevant organisations to confront disasters, and skills of individuals in charge. The search that focuses on "methodology for response effectiveness" revealed 77 references and 6.39% coverage in the collective responses provided by

the eight experts. However, this high level of knowledge on methodology used indicates that the methodology is mostly from developed countries as shown in Figure 6.12.

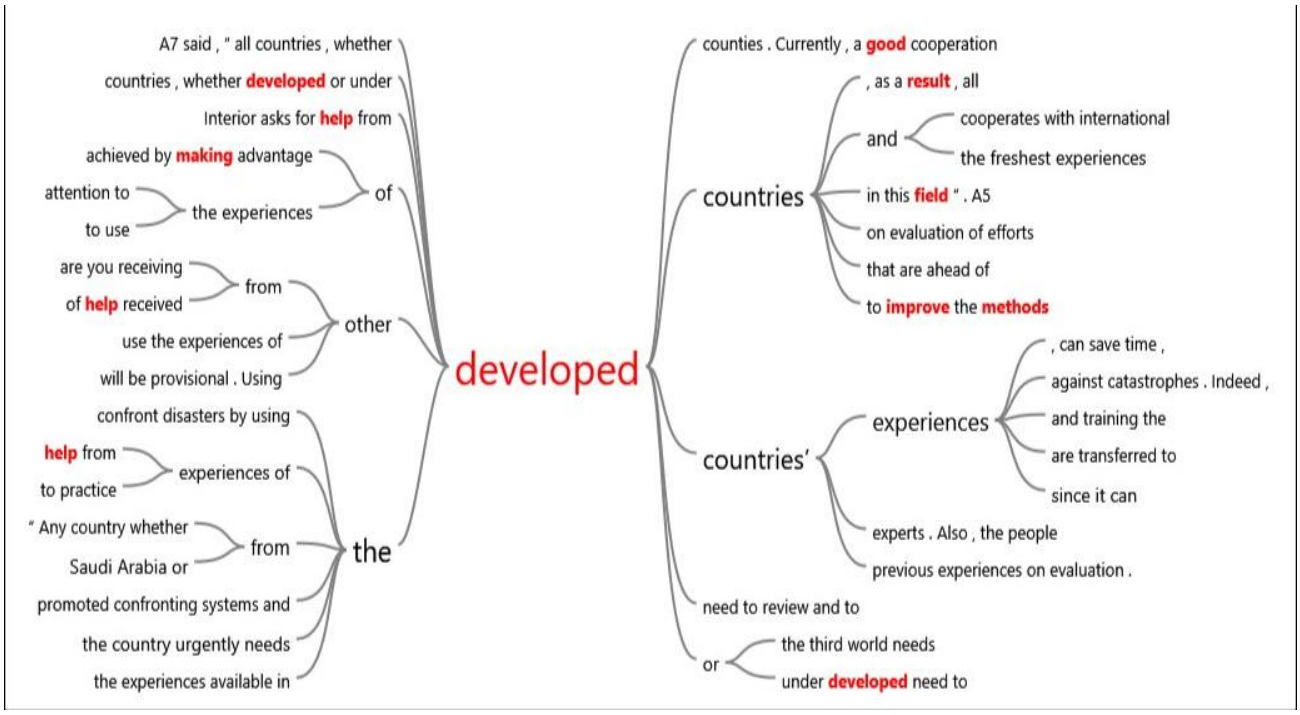

Figure 6-12: Text Query for Assessment Methodology

The text search query in Figure 6.12 based on the theme of capacity methodology indicate that methods used in KSA is mostly that of other countries or developed countries. Although the text search query shows that there is good level of cooperation for using these methods, the reality is that capacity assessment methodology peculiar to Saudi Arabia is limited or almost non-existent.

The answers to questions 1 and 2 (Appendix C) indicate that the experts in KSA acknowledge that requesting or receiving help from external sources for capacity assessment and methodologies is important. Beyond this, several answers were provided which suggest that help is being requested from the UN and developed countries who may possess global best practice in dealing with catastrophes. The answers also indicate that global best practice in capacity assessment and methodologies may be used and that assessment methods used in KSA is internationally or externally influenced and supported by foreign experts from developed countries and by UN delegates.

Furthermore, the answers provided by the interviewees indicate that conditions and factors that influence the use of experiences from other countries vary and depends on similarity of hazard scenarios, disasters that have occurred and relevance of experiences of other countries to the Saudi context.

However, the answers fail to adequately explain the global best practice or capacity development process used. It can only be inferred that the UNDP Capacity Development process illustrated in Figure 2.2 in Chapter Two is used in Saudi since 62% of the experts emphasized the partnership with UN delegations for improving their capacity for response. Besides the UN, no other specific developed country is mentioned neither is any specific Arab country is mentioned which may help to further identify capacity assessment and methodologies for disaster management in KSA. This makes the outcome of this objective inconclusive, thus emphasizing the importance of the sets of questions asked for achieving the next objective.

6.5.1. Results for existing disaster preparedness and response capacity assessment

This section and analysis focuses on assessing the current assessment method used in Saudi since the previous section has helped to establish that foreign methods are used in KSA. The search query for this section revealed that search on “disaster preparedness effectiveness” has 196 references and coverage of 8.15%. However, the search shows that there are several types and volumes of impacts of disaster, but there is no sufficient level of preparedness in place to ensure effective response.

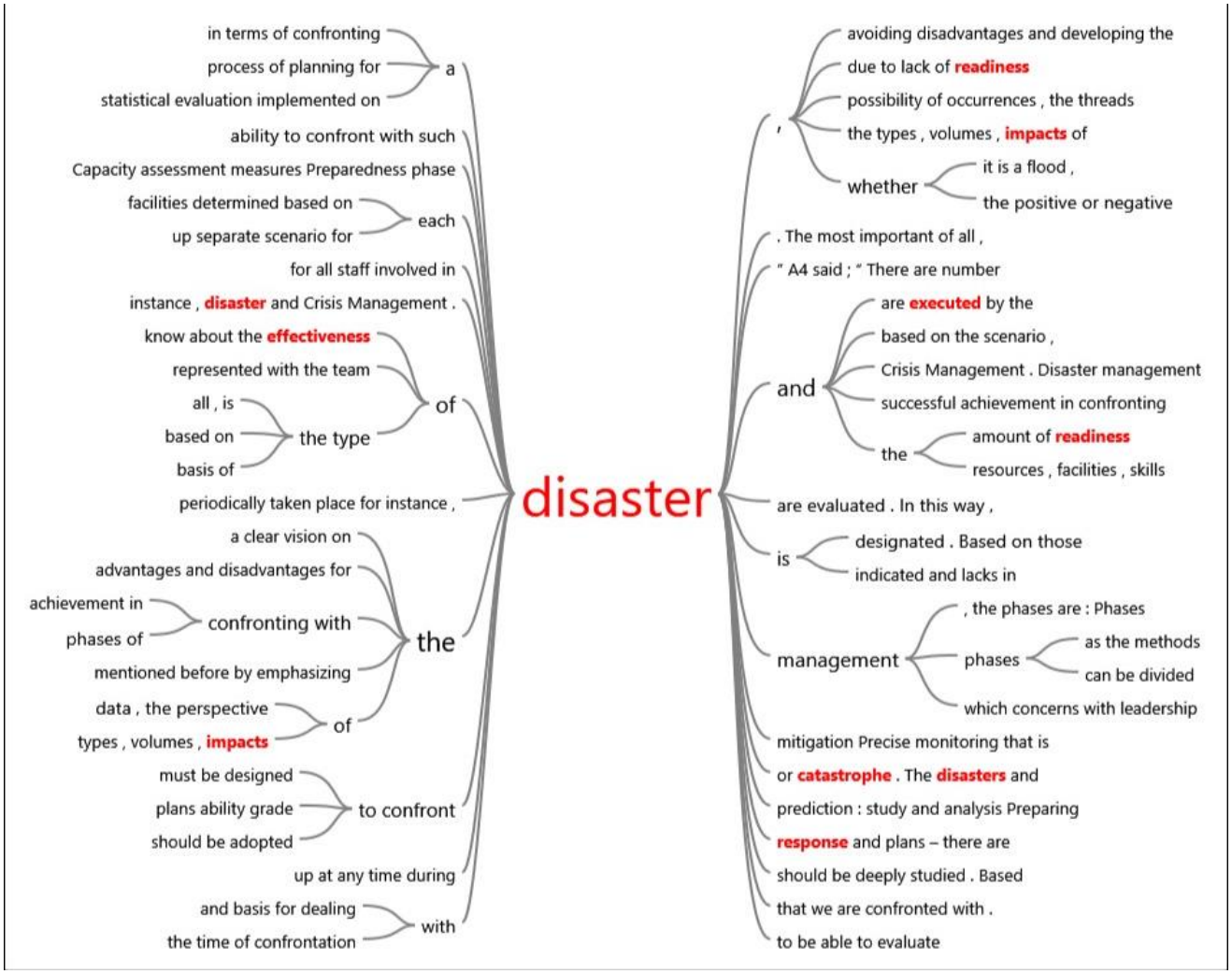

Figure 6-13: Text Query for effectiveness of preparedness capacity assessment

As observed in Figure 6.13, no emphasis is placed on any effective capacity assessment for preparedness. It can also be observed that even training, experiences and individual abilities identified as methodology for preparedness is not identified by the experts as effective for preparing for catastrophic disasters. In addition, a search was conducted for effective response capacity assessment, and this revealed similar results as Figure 6.13, where no emphasis was made to effectiveness of capacity assessment for ensuring effective response.

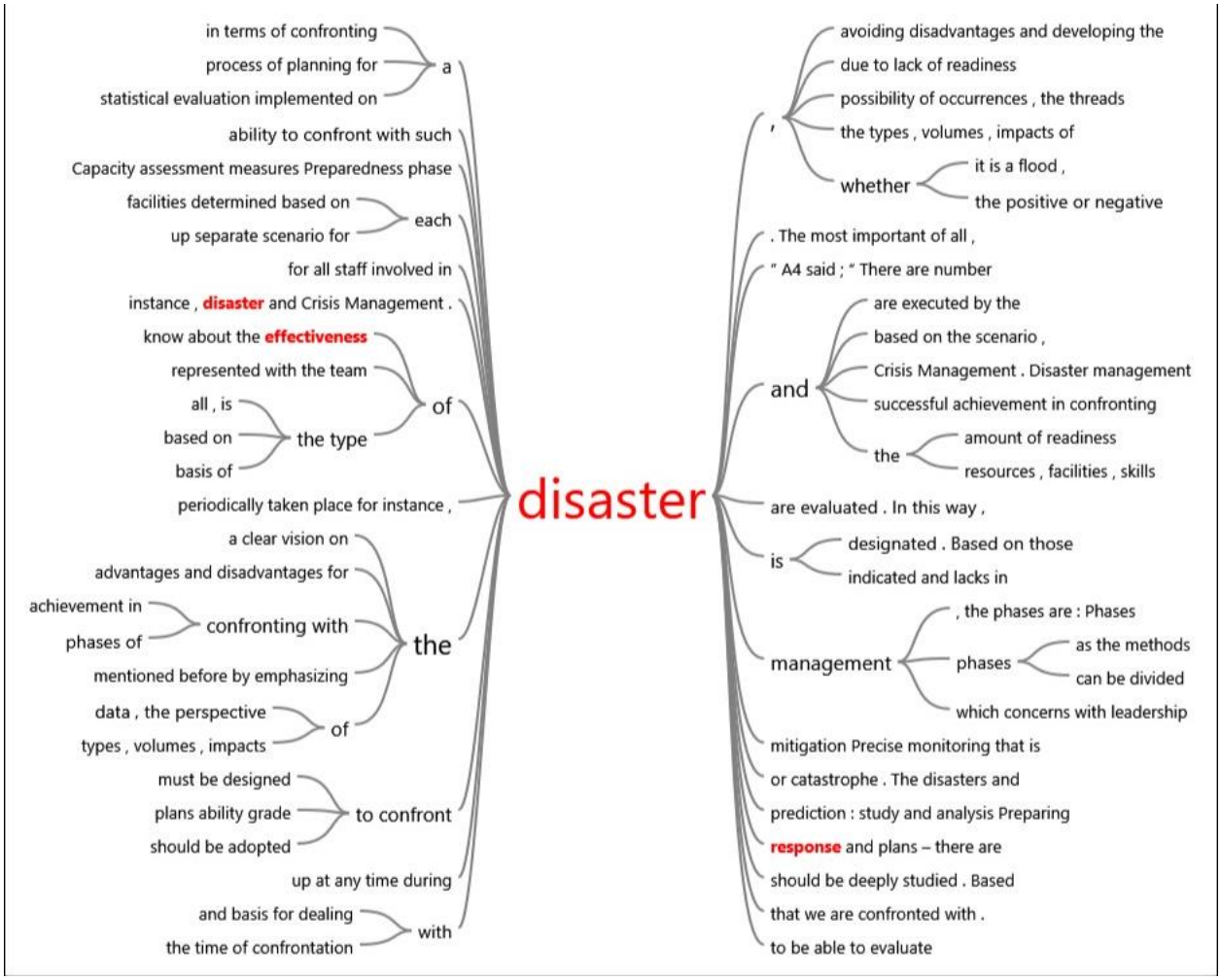

Figure 6-14: Text Query for effectiveness of response capacity assessment

The result in Figure 6.14 shows that despite using foreign capacity assessment methods, the effectiveness of response to disasters is still in doubt and cannot be explained by experts in the country. It therefore appears from this result that the existing preparedness and response capacity assessment are not as effective as they should be in confronting catastrophic disasters in the country.

It can be seen that the answers to the questions that were derived from objective 2 varied from expert to expert. Even within the same work location, there are varied views on capacity assessment methods and tools showing lack of in-depth understanding of the process or what constitute capacity assessment as examined in this research. For instance, the capacity assessment methods or tools identified by experts focused mostly on plans, emergency plans and planning. While a few experts

mentioned lessons learned from past disasters, experiences, good knowledge level and trainings, the explanations provided by the experts fail to reflect the 5-step UNDP capacity development and assessment process shown in Figure 2.2. It appears that the process is not as structured as the UN process which includes engagement with partners and building consensus, assessing capacity assets and needs, designing capacity development strategies, implementing capacity development strategies and evaluation of capacity development efforts. The lack of clarity on specific structure for capacity assessment demonstrated by experts indicate that the process in KSA may still be evolving or underdeveloped.

Regardless, the explanations provided by all experts show that there are:

- actions and activities conducted during preparedness phase
- existence of readiness arrangement
- actions taken such as training that helps to identify areas of improvement, strengths, weakness and gaps.

In this regard, it shows that in Riyadh and Jeddah, capacity assessment is influenced by the nature of disaster that is imminent, but no specific framework or method for using previous disasters to ensure that resources, facilities and skills are more appropriate for dealing with the next disaster like the CAR framework in the FEMA arrangement. The case study exposes this gaps and lack of framework or best practice methods similar to the ones identified in the literature review and the explanations provided by the experts also indicate that knowledge on capacity assessment process is limited. This assumption is made from the rating made by experts where "departments efforts in the region" and training are rated as the highest most significant factor for confronting disasters.

Unfortunately, none of the capacity system or framework examined in chapter two prioritized department efforts in the region. But rather information, communication systems, indexes, performance indicators, framework, equipment, resources and facilities were explained as crucial to ensuring adequate capacity for response. Despite this, the continuous reference to training and plans by all experts indicate that plans are used to capture lessons learned from past disasters to ensure that more and suitable resources and facilities are used to evaluate capacity for dealing with future disasters.

In this sense, it can be inferred that plans are the capacity assessment tools and methods used in Riyadh or in KSA for dealing with or mitigating the impacts of disasters. However, the case study indicated that Riyadh was one of the cities affected during the two disasters, suggesting that using plans as the only capacity assessment tool is insufficient. Perhaps challenges exist which may be responsible for ineffectiveness of the tools used in KSA. The next question is asked to identify if challenges exist in order to determine the extent to which they may impact response to disasters and catastrophes.

6.5.2. Results for challenges of capacity assessment

The interview results show that experts working in the field of disaster management in Saudi Arabia acknowledge that problems exist in terms of capacity assessment. Challenges identified were related to inability to evaluate disaster confrontation, evaluating abilities for dealing with disasters and evaluating the capabilities for response against disasters or for confronting catastrophes as revealed in Figure 6.15.

Figure 6-15: Text Search Query for challenges in KSA

They were able to identify the following challenges as factors responsible for making capacity assessment ineffective.

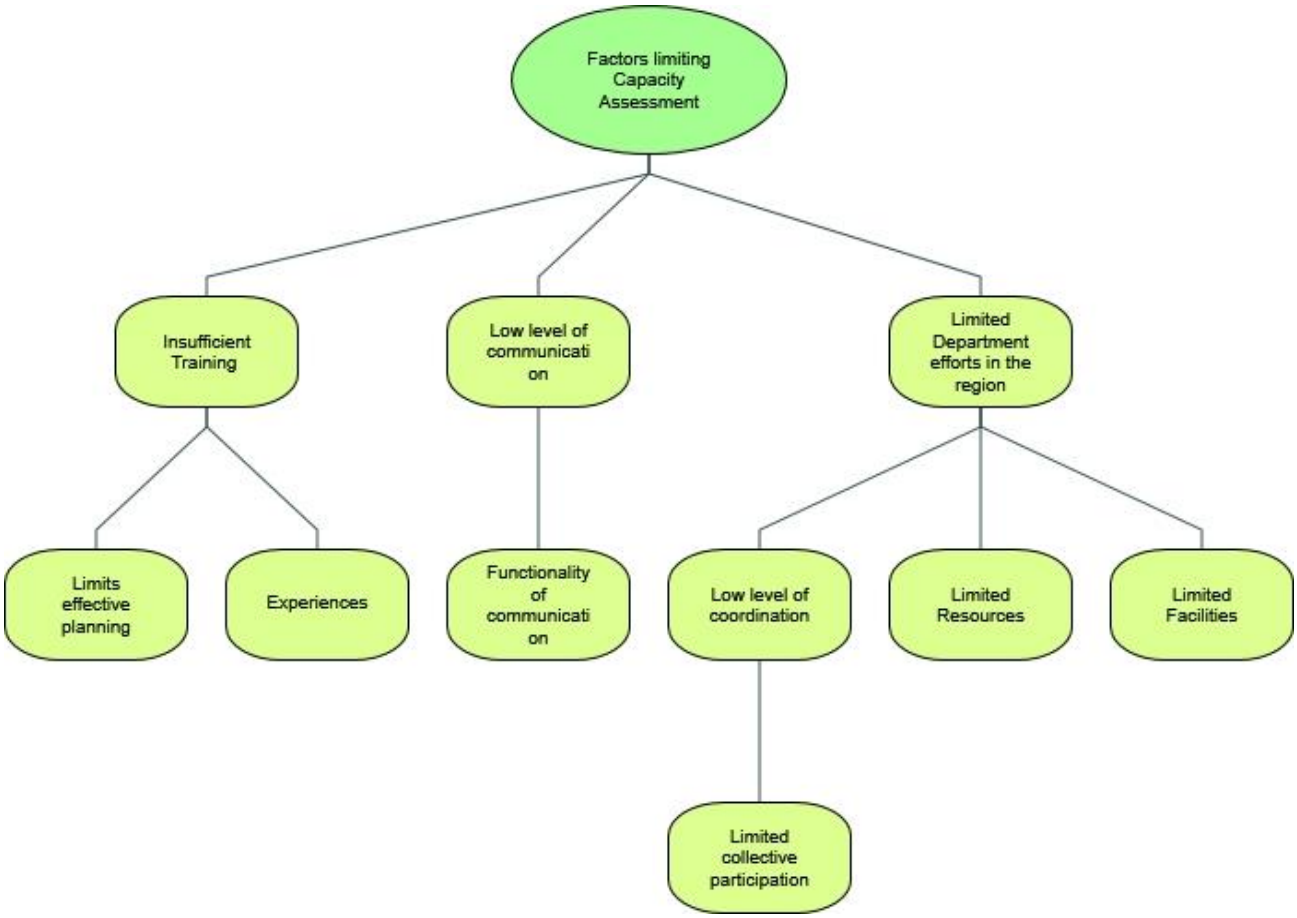

Figure 6-16: Mind Map Queries for impacts of challenges of capacity assessment

Figure 6.16 shows that not only are the foreign methodologies not effective as identified in previous sections, the challenges of capacity assessment in KSA also indicate that they have further impacts. Although training exists for enhancing capacity for response, they are insufficient, which further limits effective planning and experiences used for confronting disasters. The low level of communication, further cause low communication functionality during disaster response, while the limited department efforts on the issue of disaster preparedness and response capacity assessment results in low level coordination, limited resources and facilities and limited collective participation.

The mind map shows how one thing leads to another, thereby limiting response capabilities for dealing with disasters.

The interview results show that experts working in the field of disaster management in Saudi Arabia acknowledging the existing problems in terms of capacity assessment. The challenges identified by experts are issues such as poor or a lack of communication, planning, limited knowledge, low participation, function, finance resources and strategies. Problems associated with training, short come capacity assessment, lack of technology usage.

The nature of challenges identified by can classified as:

- lack of training in crisis management (Rankin et al. 2011)
- resource management issues (Son and Aziz, 2012)
- Lack of leadership and crisis management (Nancy, 2005; Lockwood, 2005; Dutton and Jackson, 1987).

It can be inferred that these challenges which are further linked to features of best practice in capacity assessment are responsible for the problems encountered in dealing with disasters and confronting catastrophes. For instance, lack of training in crisis management as examined in Chapter Two section 2.5.5 prevents teams from operating in the most effective way in the process of dealing with and preventing disasters that occur. As explained by Rankin et al. (2011), training in disaster and crisis management ensures that training objectives are defined and well known by crisis team, and that there is performance monitoring and measurement.

Such performance monitoring and measurement is crucial to guiding the skills required for effective response and in developing specific skills required for dealing with different disasters. Therefore, lack of crisis management training also mean that the appropriate resources and coordination required for dealing with disasters and confronting catastrophes may not be identified, determined and coordinated for the purpose of confronting catastrophes. Although suggestions were made for improving the current situation in KSA, it is evident that the fundamentals of capacity assessment and development process is lacking in Saudi Arabia.

As noticed, none of the suggestions made by experts except that made by expert A3 (in bold) made reference to training people in issues specific to catastrophe i.e. disaster and crisis management. The

type or nature of training suggested goes beyond routine or regular planning training, but training as explained by Rankin et al (2011) and Son and Aziz (2012) which focuses on challenges that exist in the system and disasters that are likely to occur in a country. Analysis of this statement leads to an illustrative format that may influence the framework for assessing disaster preparedness and response capability in Saudi Arabia to include:

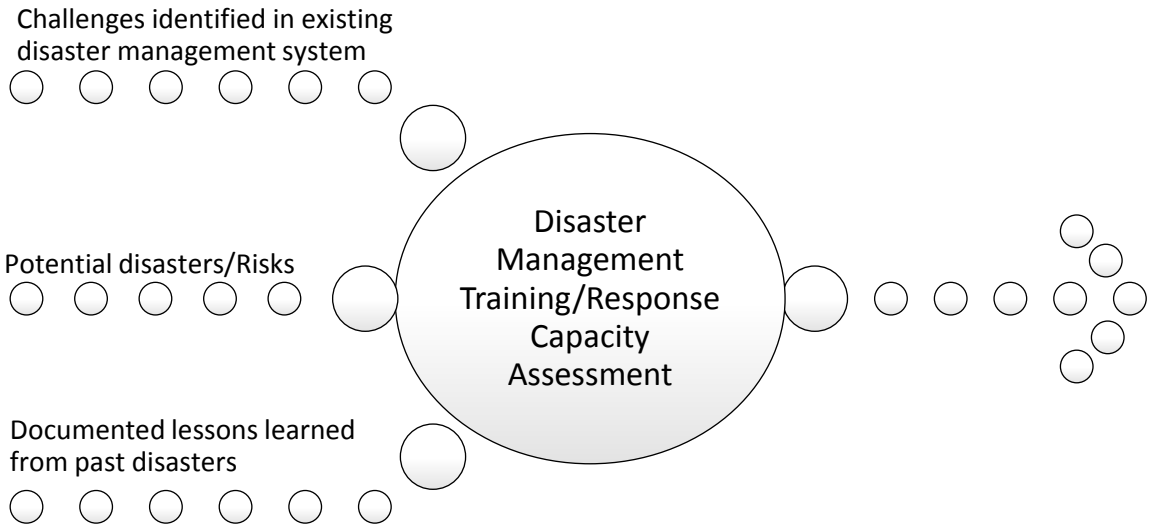

Figure 6-17: Basic elements for disaster management training and response capacity assessment

The illustrations in Figure 6.17 shows the basic elements that need to influence the content of disaster and crisis management training or response capacity assessment in Saudi Arabia. This illustration is influenced by findings on objective 1, 2 and 3 and the gaps identified in the process. Gaps identified show that the knowledge level on capacity assessment process and response arrangement for effective disaster response in KSA is limited or insufficient, hence emphasising the need for recommendations that encourages bespoke trainings. Furthermore, the result also indicates that there is need for better understanding of capacity assessment framework, methods and means of using them more effectively. The next section presents the questionnaire results on critical success factors for capacity assessment especially in the Saudi context.

The research inquiry process has helped to identify certain and important factors necessary for achieving the research aim and objectives. The interview sessions with eight experts have helped to identify the methods existing in Saudi for evaluating resources, facilities, skills and level of communications for confronting disasters. While the methods vary from the explanations provided, they also have their limitations and while some methods identified are specific or using heuristics, others were comprehensive and more structured. It was also discovered in this process that there are different factors such as resources and facilities, level of coordination and communications, training and experiences and departments efforts in operation confronting disasters.

However, their order of importance vary and this variation influence the way disasters are confronted in Saudi Arabia. Another set of key factors identified from interviews included: a) functionality of communication approaches used within the confronting region, b) support provided for key organisation involved in confronting operation and c) effective planning for confronting disasters. Although factors such as collective participation and effective training for those involved were also identified, they were considered as factors that are less effective in confronting disasters. However, this rating contradicts the explanations provided by the experts when asked about the participation and involvement of private sectors and volunteers.

The lack of involvement of private sectors and volunteers and other community was linked to lack of training, while need for more participation was identified as required for improving capacity for confronting disasters. This inconsistency of views and explanations regarding capacity development and assessment for preparedness, response and recovery indicate insufficient knowledge on the essential components, some level of confusion and requirements for enhancing capacity for disaster response in Saudi Arabia. In addition, five CSFs were identified and prioritised through the questionnaire survey. However, there are main issues that resulted from these results that emphasise the need for a capacity assessment framework.

For instance, CSF1 and the goals identified through the questionnaire respondents show that enhancing community awareness and engagement is key critical success factor for capacity development and assessment. The goals identified specifically claim the need and achievement of integrated planning that include all emergency services and organisations without including community, private or volunteers in the factor. CSF1 completely neglects private sectors and

volunteers, which are also key to community engagement. While the questionnaire failed to capture this, the interview session targeted this aspect by asking;

"*to what extent are the private sectors and volunteers' abilities are used in efforts of confronting catastrophes?*"

The series of answers to this question by the 8 experts showed division of opinions and views and probably different operations and approaches used in different cities. For example, A1 said; "*there is cooperation between the Ministry of the Interior and the private sectors and volunteers for efforts to confront catastrophes. But the Ministry of the Interior should increase the cooperation with the private sectors. This requires increase in communication and cooperation with the private sector and calling on participation of those sectors in the pre-prepared plans for confronting. Also, training should be given to the private sectors and they should be asked to take part in the assumed catastrophes plans. All information about abilities of the private sector regarding their personnel capacity and equipment must be updated. Also, in line with expanding culture of using volunteers in the country, a lot of support tasks could be carried out by volunteers and becoming volunteers must be encouraged and there should be some plans and systems developed for encouraging others to become volunteers in the country and in line with establishing an organization for encouraging volunteers, and tasks must be done by participation of the civil communities such as Universities, Schools, Voluntary and fund raising Institutions*"

A4 claimed that, "*There are some shortcomings in existing approaches in using abilities of private sectors and volunteers. First of all, for this reason, we need to have the private sector to participate in confrontation against catastrophes. This has to be done by paying adequate amount of attention to them and that can occur by planning for it. Moreover, the* ***responsibilities should be carefully defined and to be participated into executive plans****. Giving training about the most important skills should be noted. The private sector must be encouraged about its roll in confronting operations. The* ***Media's efforts for highlighting the roll of private sector and volunteers who confront catastrophes must be noted and some award must be considered and publicity campaigns need to be allocated for backing private sector for confronting catastrophes****. That will make the private sector and volunteers active. Furthermore, the roll of universities, schools, local institutions and fund raising organizations on supporting the efforts that are made by society to confront catastrophes, must be highlighted*."

The reasons for this varied answer and why volunteers and private sectors are not used much is probably due to the response by A3 who said; "*There are a close cooperation between the Ministry of Interior that handles catastrophes and private sector and volunteers. Nevertheless, this relationship is yet limited to some extend which has various reasons. Maybe the most important of all, is the* ***lack of private sector's knowledge about the plans and that causes many plans to be difficult and unclear for private sector to conduct****. Also, there are* ***some lacks in the training that are conducted for private sector****. And in respect to become volunteers to confront catastrophes, it has* ***not yet promoted to a desire level*** *which has various reasons and as I have already mentioned, maybe the most important of all* ***is lack of taking part in planning by volunteers and also failure in giving training to them****. Also,* ***there has not been a clear mechanism to become a volunteer in the country*** *and we are hoping to have the* ***regulations to be published in short time, for becoming a volunteer***".

Thus, while A4 explained what needs to be done to ensure better community engagement especially in involving private sector and volunteers, A3 provided reasons why community engagement is less engaging as it should be. A5 also provided evident factors that limits community engagement for the desired level of dealing with and confronting disasters. A5 said; "*There are cooperation between state and private sectors and some regulations are set for both sectors for confronting disasters and these regulations are the reference for using machinery and human resources, by private sector. There are some lacks on involving private sector. That is due to some reasons. One of the reason is* ***lack of paying attention to the private sector*** *and another reason is* ***lack of suitable planning and cooperation between state and private sectors****. Also, there are* ***lacks in training private sector and participating them in planning****. That causes a big gap to occur between two sectors. Nevertheless, regarding to the volunteers,* ***there is lack in asking for their help and their efforts are limited to some minor actions that show up at the event of disasters such as flooding in Jeddah****. This makes making advantage of their help to be difficult. Because,* ***they are not trained and there has never been any coordination in order to provide any kind of services during disasters***".

With this in mind, it is evident that community engagement is not currently sufficient in Saudi Arabia, neither is it enhanced due to reasons provided by A7 who said: "*Private sectors and volunteers' ability are well exercised but it is* ***not at a satisfaction level****. That relates to various reasons such as:* ***lack of a strong structure to clearly specify the private sector's task in the country****.*

This issue has impact on their performances. There are some ***lacks in coordination between state sectors and private sectors and the volunteers****. There* ***are lacks in skills and training of private sectors*** *which makes them not to be accounted during a disaster*".

Thus, while CSF1 goals focus on achieving integrated planning, public education about disaster preparedness, enhancing community resilience, media and public relations, support for volunteer participation, none of these goals specifically mention the problems identified and discussed by the experts. This issue has ripple impact on CSF2, 3, 4 and 5 respectively because of their goals relate to working with other organisations, understanding disasters, increasing coordination etc. But as derived from answers to the last question, it can be seen that level of participation in disaster are not at the level required for effectively dealing with disasters in Saudi as seen in the case study analysis in the previous chapter.

For example, A3 said; "*I think the most important of social efforts will be participating of civilians in managing catastrophes. When the volunteering system promotes, we definitely will have competent volunteers to help handling the catastrophes and this will show out itself in a successful handling of catastrophe. The vice versa is also true. We remember the incident in Jazen Hospital in 2015, that civilian participation in withdrawing victims helped to obstruct civil defense, since the volunteers were in lack of skills and that caused volunteers to suffer harm which in turn, caused delay on saving lives and victims reached late to hospitals. Therefore, in the efforts to confront catastrophe, organizing and cooperation between official parties and private sectors and volunteers should be considered. And information and method of conducting catastrophe must be trained*."

A4 also emphasized that; "*The society is the target of the government's efforts. Therefore, the institutions involved into the confrontation must note more on participation of society in these efforts. Because, these efforts will provide protection and safety for the society. Hence, there are some lacks in making communications with society and that makes us responsible giving instructions advanced to any disaster occurs. Contact must be set up with universities and schools and a set of trainings should be held for them. The publicity should be noted since fast and effective conveying information and instructions advanced to the disaster or during the disaster is important. Consequently, the true and reliable news should be publicized. Updating the methods and ways of social awareness and promoting general knowledge in the society must be noted regardless of age and cultural variances. The connection with society through social Medias should be encouraged since this will help the*

confronting institutions and therefore will save time and man force. And also, there will be help from volunteers to the institutions involved in the confrontation with catastrophe. Hence, focusing on the efforts of the society and deploying it and encouraging actions and coordination at the time of disaster for a positive reaction is important."

While these explanations relate to CSF1, it shows some of the problems and challenges that may be imminent in confronting disasters in the future, which is why A5 explained that culture of volunteer is important for developing more capacity for response;

"*The society is the main target for the efforts of state and private sectors to be protected against disasters and dangers. That cannot happen without cooperation between society and state. Hence, the society should bound to the regulations and instructions which provide protection. This cannot be achieved but by promoting knowledge of the society through university and institutions, paying attention to safety and security, assisting sections that deal with disaster. In this regard, committing with regulations should be focused and must be immediately circulated to ensure safety of countrymen. This will save money and man for those bodies who confront disasters. Emphasizing on culture of becoming volunteer in the society and spreading its meaning into the society through the Social Media, using scientific and simple methods, focusing on youth, and also efforts for change in faulty understandings. Applying Media so that publicity with no rebroadcasting is ensured, and also giving warnings by the social Media and describing sections' difficulties that are confronted, and type of assistance that society can offer to make the entire effort successful*."

Therefore, the results and others included in Appendix outlined and explained several issues, but while the goals of the CSFs may be appropriate they are still limited in their ability to ensure that the required level of capacity for confronting disasters in Saudi are developed and deployed. This limitation has significant implications for the results of this research.

Limitation in CSF1 that influences other CSFs have shown that the main implication of the results and outcome of the fieldwork is that mechanism for ensuring that capacity assessment process is more effective is needed in Saudi Arabia. While prioritizing, the CSFs have been helpful, the interview sessions with experts have helped to exposed some of the limitations of the CSFs identified and areas that require improvement. In light of this, developing a framework which is the aim of this research is important for capturing the essential aspects of the CSFs as well as best practice in

capacity assessment that can help to enhance and reinforce preparedness, response and recovery arrangement for dealing with disasters in Saudi Arabia.

Furthermore, the CSFs identified and prioritized using the questionnaire survey are shown to be relevant to the Saudi context, but limited in their impact and ability to ensure the required capacity are developed for confronting disasters. The case study analysis conducted in this chapter also exposes this limitation suggesting the need for a platform that brings all the best practice together, but one addresses the limitations identified through the interview sessions and gaps in the CSFs as explained in this section.

6.6 CHAPTER SUMMARY

This chapter has summarised the process followed for validation of DRCA framework. Formulation of expert focus group was explained, followed by implementation of the framework within DRCA framework. Both qualitative and quantitative feedback generated in the evaluation process was explained. Results gather establish that DRCA provide a robust method to capture disaster capacity assessment maturity data.

Chapter 7 CONCLUSIONS AND RECOMMENDATIONS

7.1 INTRODUCTION

The purpose of this chapter is to conclude this research. This chapter briefly summarises the findings for each objective and research questions and how the results were achieved. Section 7.3 discusses the recommendations that complements the roadmap outlined in the previous chapter, but also includes recommendations for future research. The last section explains the research limitations, measures taken to manage them and approaches for completing the research. This section also contains an overall summation of the thesis.

7.2 MAIN RESEARCH FINDINGS

Emphasis have been placed on the importance of capacity assessment as a mechanism for ensuring adequate preparedness for disaster response. This does not infer that preparedness will always be perfect for confronting any disaster. But to encourage culture of continuous monitoring and evaluation of response performance in relation to the impacts of disasters especially when they occur in large scale. Several authors have contributed to this argument and throughout this thesis, reference have been made to global best practices ranging from the methodology used and recommended by the UN to those used in countries such as Japan, USA, UK, New Zealand, Taiwan to mention a few.

Amongst the review conducted of methodologies used in these countries, it was discovered that capacity assessment best practice has specific features outlined in Table 2.2. This is then used as basis for examining the existing structure in KSA, as a result of this process, the research findings can be summarised as follows:

- Achieved through secondary data, 14 features of global best practice were identified (Table 2.2). This finding answers the first research question, which is: “what are the global best practice for capacity assessment framework for disaster response and arrangements?”.
- Achieved through both secondary and primary data, UN capacity assessment framework have been adopted for use in KSA. Other approaches such as emergency management system and phases are also being used adopted from other developed countries for preparing for disasters. Literature review, questionnaire and interview data collection techniques were all

instrumental to answering the question: "What assessment methods or frameworks exist in Saudi Arabia for determining disaster response capacity?". Answering this question also that part of the second objective; which sought to identify existing approaches used for disaster preparedness and response, is achieved.

- Through the case study analysis and primary data, it was possible to determine "how effective are the existing frameworks and methods for disaster response?". The findings indicate that although the UN framework and other foreign approaches may have been adopted (which most of the experts could not explain its effectiveness), it was evident through the case study analysis that they are ineffective. Answering this research question, also ensured that the second part of objective two is also achieved, but exposing a major gap in the existing system in KSA.
- Various challenges to existing disaster response capacity were identified, which included insufficient training, low level of communication and limited department efforts in the region. Being able to identify these challenges and impacts contribute to the findings for part of objective three.
- The fourth research question "what are the critical success factors required in KSA in order to enhance disaster preparedness and response capacity?", was answered through a combination of secondary and primary data. A robust Analytical Hierarchical Process (AHP) approach was used to prioritise key factors from Saudi Perspective. This is documented in detail within Section 5.3. Secondary data ensured that CSFs which have academic and practice context are selected from which five were pooled by Saudi experts through questionnaire data collection technique. These five were further analysed since the contributed to components of the framework developed.
- Findings for objectives four, five and six helped to answer research question five, which is; "how can disaster preparedness and response capacity be enhanced using capacity assessment framework in order to improve disaster resilience?". A framework is developed as presented in Chapter 5 that comprises of components and elements of concepts examined during the research inquiry process. Validation of the framework (Section 6) resulted in demonstration of approach in real life setting. The findings for the last three objectives also enlightened on how gaps identified in the research can be met and how Saudi system and structure can improve going forward.

Objectives 3 -5 focused on development of critical success factors and framework development and validation. These objectives included

- To analyse the impacts of challenges and identification of Critical Success Factors in capacity assessment of disaster response readiness
- To develop framework for assessing disaster preparedness and response capability in Saudi Arabia
- To validate and assess the disaster preparedness and response capacity assessment framework

This objective was achieved through data collected through case study analysis, focus groups, questionnaire and interviews, as well as validation done within Riyadh region. A total of fifteen Critical Success Factors (CSFs) were identified through literature relating to capacity development and assessment. These fifteen were (CSFs) further subjected to a selection and ranking process using questionnaire, and in the final form only five CSFs were identified to be most significant for capacity assessment.

Identified CSFs were generic in nature and were meant for usage in any size and type of disaster. These five CSFs namely, community engagement, effective response plan/planning, training of first responders, inter-organisational structure and communications (inter-org) which all has elements that make them functional and effective. The five CSFs and key goals to achieve these CSFs are illustrated below.

CSF 1 – Community engagement	G1 – achieve integrated planning G2 – Public education about disaster preparedness G3 – Enhancing community resilience G4 – Public information management G5 – Support for volunteer participation
CSF2 – Effective response plan/planning	G1 – Use of proactive disaster risk reduction strategies G2 – Better understanding of disasters G3 – increased co-ordination between agencies involved
CSF3 – Training of first responders	G1 – Improved training programmes G2 – Professional development G3 - Regular disaster drills
CSF4 – Inter-organizational structure	G1 – Business continuity G2 – Culture G3 – Organizational structure
CSF5 – Communications (inter-org)	G1 – Formal reporting systems G2 – Clear accountability G3 – Improving communication flow processes

Figure 7-1: Critical Success Factors prioritised for disaster capacity assessment

Figure 7.1 reflect the prioritised CSF that have been identified and the essential elements that make them effective. It can be noticed that each CSF has three to five elements that need to be implemented in order to attain the success and effectiveness of each CSF. While elements of each CSF were not directly tested in this research, further analysis and inquiry from case study of past disasters and interview revealed that community engagement is lacking and communications (inter-org) are grossly lacking. While continuous reference was made to response plan/planning and training of first responders during the interview sessions, past disasters indicate that response planning is not effective, neither is training of first responders since elements of each CSF were not evident. Thus, accounting for inability of responders to confront disasters effectively as observed in chapter four.

Based on the key findings of this research, recommendations for practice and future research are discussed in the next section.

7.3 RECOMMENDATIONS

Not all research studies set out to provide recommendations, but this one has a few recommendations that have been motivated due to gaps identified during the inquiry process. For instance, for practice in Saudi Arabia to be improved, it is highly pertinent to:

- Assess and understand foreign practices or methodologies before adopting it for use. This is to ensure that such practices and methodologies are suitable for the Saudi environment, and system and that they will be effective when applied.
- Develop strategy or roadmap that includes evaluation for implementing any disaster management procedures and methodologies. This will help to determine if the method or practice adopted is effective or not.
- Tailored training and simulation exercises should be organised to test arrangements for any disaster management practice and method to confirm their "fit-for-use" status in Saudi Arabia. It is good practice not to wait for a disaster to happen before such arrangements are confirmed as effective or not.
- The roadmap outlined in this thesis is important and need to be used as a guide for applying the framework in Saudi Arabia. An annual review should also be conducted to determine any area of improvement in the system especially after disasters have occurred.

While the above outlined recommendations relate to practice field of emergency and disaster management, the following are recommendations that relate to the academic field:

- More researches in the area of capacity assessment, especially in identifying tools, measures and mechanisms, and their effectiveness in enhancing response, recovery and mitigation of disasters are encouraged. During the research inquiry, it was noticed that practice, reports and global documentation were more available on this theme and topic than academic texts, thus suggesting that this area is scarcely researched.

- Further inquiry into capacity assessment framework and elements that are required for all the phases (mitigation, preparedness, response and recovery) is encouraged. Since this research has focused on preparedness and response, it may be useful if further researches undertaken in this field focus on a more holistic approach to disaster management capacity assessment.

These two recommendations for future research are key to future contributions in this field of study. However, in the immediate, this research also made some contributions which are discussed in the next section, along with limitations experienced and the conclusions.

7.4 AREAS OF FUTURE RESEARCH

As indicated in the last section, this research has made contributions to the academic field of disaster management. However, specific areas of future research are evident and one of these areas relates to the importance of investigating and critically assessing the suitable mechanisms for the four phases of disaster management in KSA. Although the four phases used in KSA is slightly different from the terminologies used in other countries, most countries examined in this research such as Japan, New Zealand, and Taiwan also have a four-phase disaster management process. Thus, this future research area has potential of contributing to the academic field of disaster management in the KSA and globally.

Another area of future research is importance of conducting an investigation to research on potentially useful elements that can constitute to capacity assessment framework that covers other aspects of disaster management. These aspects include mitigation, preparedness, response and recovery, of which the outcomes of this potential research area have the inform other concepts of disaster management like vulnerability, adaptive capacity, exposure and other concepts that influence ability to achieve disaster resilience.

Lastly, another area of future research is for an in-depth investigation to be conducted that may subject the frameworks developed within and as a result of this research into further analysis to determine their sustainability. It is important to examine or analyse frameworks in order to determine their application within wider context beyond the KSA environment which has been the focus of this research. Since disaster management is a global concept that benefits communities affected by the

severe impact of disasters, it is beneficial for the frameworks in this research i.e. DRCA and DMCA frameworks to further scrutiny that may demonstrate their application in other countries, thereby leading to knowledge sharing and best practices as done in chapter two of this research.

7.5 RESEARCH LIMITATIONS

The research limitations can be traced to the limited data in KSA on this topic since this is an under-research topic. References and data used were largely based on practice document and not academic work. Despite this limitation, background and context were derived from existing literature on disaster management written by foreign authors which guided the researcher to developing the research questions peculiar to Saudi situation. The sample size for the questionnaire is rather small to establish a relationship between answers provided by the research participants and the overall situation in Saudi Arabia regarding capacity assessment and development for responding to disasters. However, the case study analysis and deliberate decision to only recruit experts helped to minimise the impact of this limitation. Combining data from the case study analysis with the interview, focus group and questionnaire data enabled reliable and valid data that were analysed to arrive at the findings and conclusion made.

Furthermore, access to emergency organisations and availability of experts were equally limitations that almost prevented this research from completion. Decision to recruit experts for as the research participants in order to minimise a limitation almost caused another crisis that may have impacted the inquiry process. Due to the busy schedule of experts and their involvement in either leading planning or response for their organisation, it was almost impossible to find a long enough time to conduct interviews with them. However, collecting the data over an extended period helped to prevent this limitation from hampering the research. Hence, this research is not without its limitations, but they were managed constructively and creatively so that the research can be completed without any major crisis that may have crippled its successful completion.

7.6 RESEARCH CONTRIBUTIONS AND CONCLUSIONS

Despite the limitations encountered, this research has made significant contribution in knowledge and practice of emergency management. For starts, the need for capacity assessment have been emphasised throughout this research and it has provided better understanding of the process required to ensure capacity assessment is conducted so that response to disasters can be improved before disaster occurs. Through the framework developed in this research, severe impacts caused by disasters in Saudi are expected to be mitigated and reduced if and when applied appropriately.

In addition to this, the changing role of emergency responders and challenges encountered are expected to be better managed through stages incorporated in the framework. Another obvious contribution is that made to knowledge and empirical data that may constitute to existing data on capacity assessment in Saudi for future research in this area or related field. DRCA framework developed and implemented in this research provides a robust method to address existing knowledge gap within KSA related to disaster capacity assessment. Also, validation of the proposed framework within Riyadh region helped establish a real-life case study, which helped demonstrated effectiveness of approach adopted in collected relevant qualitative and quantitative data.

It can then be concluded that this research has not only made impacts in the practice field of emergency and disaster management, but also in the academic field. It has demonstrated that despite global practices that may be available for application in countries like KSA, it is important that attention is given to its application and mechanism for operation within local context. Analysing past case studies in Saudi have generated useful data that enhanced the conclusion made from data collected through questionnaire, interview and focus group discussion.

The framework was developed as a result of conducting this inquiry is one of the commendable step that can be taken to improve capacity of first response organisations in Saudi Arabia. It is also important to ensure that the application of the framework translate into effective disaster response to disasters in KSA. Therefore, this research has been worth undertaking, and it is the vision of the researcher that this academic work motivates more researches in the areas identified for future research, and the practice of continuous improvement in disaster management in Saudi Arabia.

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APPENDIX A: Research Ethics Approval

University of Salford MANCHESTER

Academic Audit and Governance Committee
College of Science and Technology Research Ethics Panel (CST)

To **Nasser Bin Ottai (and Dr Zeeshan Aziz)**

cc: **Prof Charles Egbu, Acting Head of School of SOBE**

From **Nathalie Audren Howarth, College Research Support Officer**
Date **21/07/2014**

MEMORANDUM

Subject: **Approval of your Project by CST**

Project Title: **Developing a Strategic Framework to Enhance Professional Development of Emergency Responders in Saudi Arabia**

REP Reference: **CST 14/29**

Following your responses to the Panel's queries, based on the information you provided, I can confirm that they have no objections on ethical grounds to your project.

If there are any changes to the project and/or its methodology, please inform the Panel as soon as possible.

Regards,

Nathalie Audren Howarth
College Research Support Officer

APPENDIX B: Participants Invitation Letter

Nasser Binottai

PhD Student

University of Salford

School of Built Environment

Participant invitation letter

Dear Participant,

I would like to invite you kindly to take part in an interview under the title: Capacity Assessment Framework to Enhance Disaster Resilience within Kingdom of Saudi Arabia.

The interview as a part of a research study for a PhD program carried out by the researcher at the University of Salford in UK. Your participation is indispensable and of great contribution in developing framework for managing disasters and crisis in Saudi Arabia and thank you for your cooperation.

Kind Regards

Nasser Binottai

Date:

E-mail: NNN2004@HOTMAIL.CO.UK

NO; 07541855585

0555442082

APPENDIX C: Interview Questions

Interview Questions

1. What are the ways and methods that can be used to evaluate the required resources, facilities, skills and level of communications to confront catastrophes and crises in Saudi Arabia?
2. Would you specify the importance of the following factors in the operations confronting catastrophes?
3. What level is the knowledge of catastrophes programing units in the Ministry of Interior to effectively evaluate the confrontation of catastrophes?
4. What methods are used to ensure effectiveness of the operations and facilities that are used in confronting catastrophes? Such as pre-prepared plans that are executed to confront catastrophes?
5. What helps and experiences are you receiving from other developed countries on evaluation of efforts of confronting catastrophes?
6. What are the main factors that are effective on confronting catastrophes?
7. What are the major challenges on evaluating the capabilities of confronting catastrophes?
8. What are the suggestions for improvement and strengthening the confrontation of catastrophes in the country?
9. Do you think that the country needs to use the experiences of other developed countries to improve the methods of confronting catastrophes?
10. Are the previous reports and statistics used to obtain the experiences to be used for the future plans of confrontation? What are your suggestions for better use of documents and reports?
11. In what extend are the private sectors and volunteers' abilities are used in efforts of confronting catastrophes?
12. What is the level of participation in the society on efforts of confronting catastrophes and what are the ways to activate it?

Appendix D: Sample Interview Questions

Primary data: Please put a tick (✓) in the box that seems most appropriate for each of the statements below.

Section One

Questions	Answers	Type
1. Age group	☐ 25-35 years old ☐ 36-45 years old x☐ Over 45	One choice
2. Work area	Please specify: …….Jeddah…….	Written
3. Rank	☐ Captain ☐ Major ☐ Lieutenant colonel ☐ Colonel x☐ Brigadier general	One choice
4. Educational level	☐ Bachelor x☐ Master ☐ PhD	One choice
5. Have you joined programs dealing with disasters and crises?	x☐ Yes ☐ No	One choice
6. If yes How many?	☐ 1-5 ☐ 6-10 x☐ 11-15	One choice

		x☐ More than 15	
7.	Type of programs dealing with disasters. Please tick all appropriate boxes.	x☐ Dealing with natural disasters x☐ Dealing with industrial disasters x☐ Dealing with disasters caused by people	Multiple choices

Interview No1:

Interviewing individuals or leaders in charge of confronting natural crisis and catastrophes from Ministry of Interior in Kingdom of Saudi Arabia.

First: What are the ways and methods that can be used to evaluate the required resources, facilities, skills and level of communications to confront catastrophes and crises in Saudi Arabia?

There are various ways and methods that can evaluate the resources, facilities, skills and the level of communications that are required for confronting catastrophe and crisis in Saudi Arabia. The most important of those methods relies on the type of incident and catastrophe that the country facing with. For example to confront rain and flood, as well as fire, there are some preparations but the civil defense in order to evaluate the requirements always rely on the previous incidents and also to what are requested by the relevant sectors.

Also, there are plans in the relevant sectors that are being periodically executed which helps identifying the required facilities for confronting catastrophe in the country.

Also, through the previous incidents and understanding the defaults can be used to prepare the requirement whether are related to **resources**, facilities and skills that are needed for confronting catastrophes or improving the level of communication.

Second: Would you specify the importance of the following factors in the operations confronting catastrophes?

Factors	**Very Important 1**	**Important 2**	**Important in some extent 3**	**Rarely Important 4**	**Unimportant 5**
Resources and Facilities		2			
The Level of Coordination and Communications			3		

Training and Experiences	1				
Departments' efforts in the region				4	
Please name others: Preparing emergency plans and periodically executing those plans to indicate the positive and negative points in order to eliminate the negative points.					

Third: What level is the knowledge of catastrophes programing units in the Ministry of Interior to effectively evaluate the confrontation of catastrophes?

There are good deals of knowledge within the planning units in the Ministry of Interior. But this planning needs cooperation between other sections of the government and contributing and training the private sectors in the planning for confronting catastrophes in the country.

Forth: What methods are used to ensure effectiveness of the operations and facilities that are used in confronting catastrophes? Such as pre prepared plans that are executed to confront catastrophes.

There are the numbers of pre prepared plans that are conducted by the Ministry of Interior as proxy for high council of civil defense and other sectors of the government. For example the general emergency plan in which the entire governmental sectors and bodies participate and supervised by the high council of civil defense, headed by the Prince, as the Minister of Interior and with membership of all the ministries of the country and also ministry of defense and ministry of National Guard.

Also, there are numbers of plans for confronting flooding in the country which required emergency meetings in cities throughout the country headed by the regional governors and managed by membership of entire governmental bodies. These plans are pursued by the Prince, the Minister of Interior and later are concluded and the cons and prose are evaluated for further improvement.

Fifth: What helps and experiences are you receiving from other developed countries on evaluation of efforts of confronting catastrophes?

There are limited amount of helps are used from other developed countries' previous experiences on evaluation. Yet, the country is trying to improve its efforts and skills by sending its staffs to abroad in order to achieve new experiences and also through inviting experts on catastrophes for giving conferences in the country. Although there are constant cooperation between the Ministry of Interior and the United Nations' delegations to improve this cooperation.

Sixth: What are the main factors that are effective on confronting catastrophes, indicate them based on importance:

Factors	**1**	**2**	**3**	**4**	**5**
Collective participation on confronting efforts	1				
Effective planning for confrontation			3		

Effective training of those involved in confrontation		2			
Backing the organized body involved in confronting operation					5
Functionality of communication within the confronting region				4	

Seventh: What are the major challenges on evaluating the capabilities of confronting catastrophes?

Firstly the weakness of those who evaluate the abilities of the confronting catastrophes within the country. Sometimes the evaluation of abilities is far away from the reality. The reason is that the evaluators are being in distance with realities of the catastrophes in the country and to this reason the evaluations are mainly based on theories and are far away from practical efforts. Also, lack of documentaries on the previous catastrophes is another reason and even if those documents are available, those documents will be confidential and evaluators and staffs from ministry of interior cannot reach them.

The next point is the improvement of the training on confronting catastrophes that is needed to be developed in a great deal and the training courses should be in adherence to the dangerous that the country is confronting with.

Eighth: What are the suggestions for improvement and strengthening the confrontation of catastrophes in the country?

The collective participations should be accentuated, because the society is the first party affected by these dangers and the government has assisted the country men at the time of hazards and catastrophes and gave support to them. Therefore the government should concentrate on involving the society and awakening towards dangers that are pointed on them and to increase the awareness of all the country fellows and residents so that the society pay attention to protect themselves and to be aware of the best method of protecting themselves.

Also, cooperation and working with various Medias and Social Medias is needed to persuade awareness and participation in efforts of the confrontations.

Concentrating on training those who are involving in confrontation with catastrophes and bringing up the most updated information, knowledge and experiences regarding to the confronting catastrophes and calling on volunteers and private sectors in government efforts for advancing confronting catastrophes abilities should be followed.

Ninth: Do you think that the country needs to use the experiences of other developed countries to improve the methods of confronting catastrophes?

Any country whether from the developed or the third world needs to be reviewed and evaluated; we should try to make advantage of other countries' experiences on confronting with catastrophes. The Kingdom of Saudi Arabia tries to use the experiences of developed countries and cooperates with international organizations such as the United Nations' delegation to use their experiences on confronting catastrophes and also there is cooperation on exchange of experiences and lessons gained from catastrophes between Saudi Arabia and neighboring countries.

Tenth: Are the previous reports and statistics used to obtain the experiences to be used for the future plans of confrontation? What are your suggestions for better use of documents and reports?

Indeed, the statistics and reports about the previous catastrophes are part of the best resource for planning and using the lessons gained by the catastrophes. Yes, the reports and statistics and data on the previous incidents are used but this is not comprehensive and as it is expected.

I suggest that the department of catastrophes' statistics and data should be extended and modern software should be used to produce reports and data and statistics should be simplified and reachable for planner and evaluators of catastrophes.

Eleventh: In what extend are the private sectors and volunteers' abilities are used in efforts of confronting catastrophes?

There are cooperation between the Ministry of the Interior and the private sectors and volunteers for efforts to confront catastrophes. But the Ministry of the Interior should increase the cooperation with the private sectors. This requires increase in communication and cooperation with the private sector and calling on participation of those sectors in the pre prepared plans for confronting. Also, training should be given to the private sectors and they should be asked to take part in the assumed catastrophes plans. All information about abilities of the private sector regarding to man forth and equipment must be updated.

Also, in line with expanding culture of being volunteers in the country, a lot of tasks should be carried out and becoming volunteers must be encouraged and there should be some plans and systems developed for encouraging others to become volunteers in the country and in line with establishing an organization for encouraging volunteers tasks must be done by participation of the civil communities (such as: Universities, Schools, Voluntary and fund raising Institutions).

Twelfth: What is the level of participation in the society on efforts of confronting catastrophes and what are the ways to activate it?

There is social participation that takes place in efforts of confronting catastrophes. Saudi Arabia's society is a cooperative society in an emergency situation. But these efforts need to be developed, coordinated and leaded and should be under umbrella of the department that possess organization. Such a thing would need cooperation between the Ministry of Interior and civil communities and also awareness of understanding the dangers and cooperation that should be persuades while it occurs.

Publicity campaign should be concentrated which aims the society to take part at the time of confronting catastrophe and during a catastrophe, volunteers should be called for help. Therefore they should take part in assumed plans and they should be educated about confronting catastrophes and these efforts must be carried under umbrella of a department and an organization so that to be ready to take part against catastrophes.

Primary data: Please put a tick (✓) in the box that seems most appropriate for each of the statements below.

Section One

Questions	Answers	Type
8. Age group	☐ 25-35 years old ☐ 36-45 years old x☐ Over 45	One choice
9. Work area	Please specify: …….Jeddah…….	Written
10. Rank	☐ Captain ☐ Major ☐ Lieutenant colonel ☐ Colonel x☐ Brigadier general	One choice
11. Educational level	☐ Bachelor x☐ Master ☐ PhD	One choice
12. Have you joined programs dealing with disasters and crises?	x☐ Yes ☐ No	One choice
13. If yes How many?	☐ 1-5 ☐ 6-10	One choice

	x☐ 11-15 x☐ More than 15	
14. Type of programs dealing with disasters. Please tick all appropriate boxes.	x☐ Dealing with natural disasters x☐ Dealing with industrial disasters x☐ Dealing with disasters caused by people	Multiple choices

Interview No2:

First: What are the ways and methods that can be used to evaluate the required resources, facilities, skills and level of communications to confront catastrophes and crises in Saudi Arabia?

The resources and facilities determined based on each disaster or catastrophe. The disasters and the actions taken are continuously referred and instructions are given. We know that civil defenses are practical and requires participation of governmental and private sectors and moreover, civil communities such as universities, schools. Consequently, all parts whether governmental or private sectors should be involved in these efforts. Also, since students are accounted as the connecting point between family and society, a series of courses should be conducted periodically to promote knowledge of various sectors of the society. Some attentions need to be paid on planning the disasters and based on each plan, the requirement of that plan should be designated. Any lack of equipment and skills or level of communication shows that those lacks should be noted and focused.

Second: Would you specify the importance of the following factors in the operations confronting catastrophes?

Factors	**Very Important 1**	**Important 2**	**Important in some extent 3**	**Rarely Important 4**	**Unimportant 5**
Sources and Facilities	3				
The Level of Coordination and Communications	1				

Training and Experiences	2				
Departments' efforts in the region	4				
Please name others:					

Third: What level is the knowledge of catastrophes programing units in the Ministry of Interior to effectively evaluate the confrontation of catastrophes?

In some extend, within planning units in the Ministry of Interior, there are some knowledge about the effective methods to evaluate confrontation with catastrophes. Nevertheless, since there are connections between tasks related to the catastrophes, it requires collective participation, whether by other governmental sectors or private sectors to set a plan which can be successfully conducted to confront crisis. By participation of all state and private sectors, the effective methods of planning should be reviewed and then a simple mechanism must be driven to conduct it and then by participation of all parties, in planning and execution, those efforts should be evaluated.

Forth: What methods are used to ensure effectiveness of the operations and facilities that are used in confronting catastrophes? Such as pre prepared plans that are executed to confront catastrophes.

Yes, some plans are already set up for conducting and these plans varies based on the type of disaster and are executed by the relevant parties and later are evaluated and updated. Nonetheless, lack of updating, makes it difficult to be conducted. Also, there are complicated plans which are not clear, therefore those are not easy to execute, and are not practicable. Accordingly, the plans should be simplified and straightforward. The responsibilities should be clear and distributed between the participants and responsibilities should be so easily distributed to help prevent mission interferences. Likewise, a precise observing system should be ordered to evaluate the cons for strengthening and the pros for eliminating in future.

Fifth: What helps and experiences are you receiving from other developed countries on evaluation of efforts of confronting catastrophes?

To promote actions, systems and regulations relating to confronting with catastrophes, the Ministry of Interior asks for help from developed countries' experts. Also, the people in charge within the Ministry of Interior are informed of new experiences achieved by other countries and they visit those countries and try to use new technologies in planning.

Sixth: What are the main factors that are effective on confronting catastrophes, indicate them based on importance:

Factors	**1**	**2**	**3**	**4**	**5**
Collective participation on confronting efforts		2			
Effective planning for confrontation	1				
Effective training of those involved in confrontation			3		
Backing the organized body involved in confronting operation					5
Functionality of communication within the confronting region				4	

Seventh: What are the major challenges on evaluating the capabilities of confronting catastrophes?

There are some challenges for evaluating the confrontation of catastrophes such as cooperation between state sectors and private sectors that refers to lack of private sectors' participation in the plans for evaluating the confronting abilities with catastrophes and therefore lack of accurate evaluation of confronting with catastrophes in the country. In return, that makes weakness in planning which is due to lack of participation of civil communities in the evaluating operations and planning. There are also deficiencies in intensive planning, therefore evaluating the abilities requires planning to be conducted separately and should be carried based on dangers that each region exclusively confronts.

Similarly, there are weakness on educating experts who are involved in evaluations which needs more training and updating the plans for confronting catastrophes.

Eighth: What are the suggestions for improvement and strengthening the confrontation of catastrophes in the country?

First: Accurate planning based on precise statistical knowledge and information.

Second: Taking part by state and private sectors who are involved in the tasks of catastrophes within the country.

Third: Exclusive planning and planning of each region by itself.

Fourth: Plan should be easy and applicable and should be reviewed periodically.

Fifth: Conducting the plans periodically and accurately indicating the responsibilities and eliminating the existing faults. Having quality and comprehensive criterions during all the stages and also in the stage of preparation or in the stage of confronting with renovation.

Ninth: Do you think that the country needs to use the experiences of other developed countries to improve the methods of confronting catastrophes?

Yes, the country need all the experiences available in the developed countries, as a result, all disasters must be reviewed and should be submitted to collect the experiences and based on those experiences, plans and preparations must be carried. Because, the catastrophes vary and therefore it needs to have flexible actions and new plans to confront them.

Tenth: Are the previous reports and statistics used to obtain the experiences to be used for the future plans of confrontation? What are your suggestions for better use of documents and reports?

Those experiences are used in some deal. But advantage of statistical documents and report must be strengthened and all the experiences whether positive or negative should be reviewed. This will help prevent mistakes to be repeated and will strengthen the positive points. These reports and statistics should also be at reach to planners, staffs and experts as a reference for planning.

Eleventh: In what extend are the private sectors and volunteers' abilities are used in efforts of confronting catastrophes?

There are cooperation between state sectors and private sectors in confrontation. Nevertheless, these efforts have not been promoted to a satisfied level. Therefore, the Ministry of Interior tries to deploy culture of becoming volunteer within universities and schools and also tries to involve private sectors and the volunteers. It depends on many efforts which should be handled by Ministry of Interior and also participation of Medias in this regard. So far, participation of those taking part has been little and is not at expectation level.

Twelfth: What is the level of participation in the society on efforts of confronting catastrophes and what are the ways to activate it?

Indeed, the society is major factor for being successful in the efforts that are conducted, since it relates to the society and the society is the target to be protected, therefore the society should have enough knowledge on ways of confronting with these dangers. The society should be brought to take part in planning for catastrophes. Correspondingly, these plans must be simple and without any difficulties and circulated. And awareness about the dangers must be propagated within universities, schools and civil communities. Volunteers should be encouraged. To circulate these understandings and encouraging volunteers' union, cooperation between the Ministry of Interior and fund raising institutions should be preserved so that if some disaster is unwillingly occurred, all the required preparations should be available.

Also, the media and social media websites should be used in mobilizing awareness and moreover, protective programs against dangers and national catastrophes must be used. These understandings must be implanted into the generations. State authorities should deal openly with civilians and share them with information and correction of faulty understandings. This understanding must be presented in modern methods and not through the old and classic methods.

Primary data: Please put a tick (✓) in the box that seems most appropriate for each of the statements below.

Section One

Questions	**Answers**	**Type**
15. Age group	☐ 25-35 years old ☐ 36-45 years old x☐ Over 45	One choice
16. Work area	Please specify: …….	Written
17. Rank	☐ Captain ☐ Major ☐ Lieutenant colonel ☐ Colonel x☐ Brigadier general	One choice
18. Educational level	☐ Bachelor ☐ Master	One choice

		x☐ PhD	
19.	Have you joined programs dealing with disasters and crises?	x☐ Yes ☐ No	One choice
20.	If yes How many?	☐ 1-5 ☐ 6-10 ☐ 11-15 x☐ More than 15	One choice
21.	Type of programs dealing with disasters. Please tick all appropriate boxes.	x☐ Dealing with natural disasters x☐ Dealing with industrial disasters x☐ Dealing with disasters caused by people	Multiple choices

Interview No 7:

First: What are the ways and methods that can be used to evaluate the required resources, facilities, skills and level of communications to confront catastrophes and crises in Saudi Arabia?

At the time of process of planning for a disaster, the types, volumes, impacts of the disaster, possibility of occurrences, the threads that exist and the positives and negatives points of the society in terms of confronting a disaster should be deeply studied. Based on the previous analysis, some scenarios must be prepared to evaluate the quantity of the dangers. Therefore flexible, affective plans adapted for reality must be prepared. Moreover, some plans should be ready for emergency situations. Since the threads in each region, differs to other regions, detailed plans must be prepared based on the threads that each region confronts. As indeed the targets must be identified and to evaluate them in order to promote the ability of confrontation. The Ministry of Interior supervises these plans to ensure periodic executions of the plans in order to eliminate the lacks where relates to the Ministry or relates to other participant parties. The plans must be based on specific criteria and frameworks such as regulations and does and don'ts adjusted for civil defense. The required skills must be assigned and required training must be provided to the state and private sectors and to the volunteers to prevent mistakes at the time of performance. Clarifying the missions, responsibilities and roles of each participant, and indicating the plans' targets and strategies in details are also required. Residents should participate in planning and performances

based on the scenario that is already prepared. The plans must be sent to all of the sectors and must be provided to users and performers whether they are from state or private sectors or they are volunteers, in order to strengthen the plans and activate them and to ensure the plans' success. The plans and the scenarios must be performed by using the newest methods and must be practiced and exercised during confronting disasters. A detailed evaluation and practical plans based on specific and clear scientific knowledge and by pre prepared plans must be carried. Variety of institutions participate in the evaluation process and then they hold some meetings to indicate the grade and level of success and positive and negative points of that plan in order to eliminate the mistakes.

Second: Would you specify the importance of the following factors in the operations confronting catastrophes?

Factors	
Resources and Facilities	3
The Level of Coordination and Communications	1
Training and Experiences	2
Departments' efforts in the region	4
Please name others	

Third: What level is the knowledge of catastrophes programing units in the Ministry of Interior to effectively evaluate the confrontation of catastrophes?

The units from the Ministry of Interior are fairly knowledgeable about the methods to confront disasters. Considering that the country is confronted by various dangers, constant efforts are very much required. A nationwide constitution should be established in which all of the parties have responsibility to confront disasters and role of each party must be very clearly designated. That has to be performed by participation of concerning parties in charge. Moreover, a coordinating mechanism must be established based on which to ensure the smoothness of all tasks. Also, the entire parties and regions should be brought forward to participate in the evaluation operation and the statistics and data must be at reach by the parties in charge, to update all the actions and eliminate the lacks within a cooperative framework. Eliminating the negative points and using the positive points, a task team should be established consisting of the entire participant parties to evaluate the performances.

Forth: What methods are used to ensure effectiveness of the operations and facilities that are used in confronting catastrophes? Such as pre prepared plans that are executed to confront catastrophes.

Fifth: What helps and experiences are you receiving from other developed countries on evaluation of efforts of confronting catastrophes?

The state, in their efforts against disasters, receives help from experiences of the developed counties. Currently, a good cooperation is ongoing between the state and the concerning international organizations, and we are working to deploy the cooperation and to conduct training courses for staff in the Ministry of Interior. Some training courses have been conducted and individuals in charge are sent to participate in the skilled trainings about confronting disasters.

Sixth: What are the main factors that are effective on confronting catastrophes, indicate them based on importance:

Factors					
Collective participation on confronting efforts	1				
Effective planning for confrontation	2				
Effective training of those involved in confrontation	3				
Backing the organized body involved in confronting operation	5				
Functionality of communication within the confronting region	4				

Seventh: What are the major challenges on evaluating the capabilities of confronting catastrophes?

1. Weakness in skilled training (in state and private sectors and among volunteers) to confront disasters
2. Lack of financial resources to perform a strategy against disasters
3. Weakness in required technology for confronting disasters
4. Poor function of communication systems between participant from the state and private sectors
5. Interference of responsibilities and missions between participating bodies (state and private) at the time of confrontation with the disasters
6. Lack of participation of concerning individuals from state and private sectors and the volunteers, in the training courses

7. low participation of some organizations in the confrontation
8. Lack of a nationwide delegation to back up regulations and systems of confrontation
9. Lack of knowledge and social function in confronting disasters
10. Lacks in participation of private sectors and volunteers and training departments in efforts against disasters

Eighth: What are the suggestions for improvement and strengthening the confrontation of catastrophes in the country?

1. Establishing a nationwide institution to protect regulations and the frameworks to confront disasters
2. This institution should be in connection with the Interior Minister, head of high council for civil defense
3. This institution should supervise the state and the private sectors efforts
4. This institution should work on writing principles, frameworks and policies for confronting disasters within the country
5. Deploying the frameworks, regulations and policies in the state and the private sectors and society to make the confronting against disaster real
6. Attention to notifying the society at early age by training courses through the parents
7. Avoiding theoretical frameworks for promoting plans instead of focusing on practical aspects

Ninth: Do you think that the country needs to use the experiences of other developed countries to improve the methods of confronting catastrophes?

All countries, whether developed or under developed need to review and to deploy their experiences by receiving experiences from others countries. Our country is not isolated in the world, therefore she has managed to promote its abilities to confront disasters by using the developed countries' experiences and training the concerning individuals.

Tenth: Are the previous reports and statistics used to obtain the experiences to be used for the future plans of confrontation? What are your suggestions for better use of documents and reports?

There are limited amount of exercise from previous statistics and reports and it is not at a desired level. There are various reasons for it:

First: Inaccurate data provided by the departments in charge of the statistics of disasters and its quality. This is shown in the results driven from statistic reports of the disaster.

Second: Inaccuracy in collecting information and reports that are shown in the results achieved.

Third: lack of exercising improved equipment in observation and checking statistics processes that has negative impacts on the final result

Fourth: Classifying the information of the disaster that makes decision makers and also planners to miss the most important source for planning an operation

Eleventh: In what extend are the private sectors and volunteers' abilities are used in efforts of confronting catastrophes?

Private sectors and volunteers' ability are well exercised but it is not at a satisfaction level. That relates to various reasons such as: lack of a strong structure to clearly specify the private sector's task in the country. This issue has impact on their performances.

There are some lacks in coordination between state sectors and private sectors and the volunteers.

There are lacks in skills and training of private sectors which makes them not to be accounted during a disaster.

Twelfth: What is the level of participation in the society on efforts of confronting catastrophes and what are the ways to activate it?

There are some actions taken by the society in regard to the efforts which the state takes. But due to lack of knowledge about the disasters from one hand and non-action of bodies in charge in the state, in terms of promoting their knowledge and focusing on the role of the society from other hand, these actions are not at an expectation level. Activating the society should be achieved by skilled training and notifying society about disasters and using the media and also the social media to spread information and instructions. Also, high number of employees in the country turns it as a challenge to confront.

Appendix D: Capacity Assessment tools

S.N	Tool		Objective		Key Features
1	To enhance KSA capability to manage civil defence emergencies.	A	Promote continuing and coordinated professional development in CDEM.	1	Professional development strategy and programmes are developed per organisational needs.
				2	Professional development programmes are comprehensively implemented and evaluated.
				3	"Exercising is effective in improving capability".
				4	Exercising is integrated across organisations and levels.
		B	Enhance the ability of CDEM Groups to prepare for and manage civil defence emergencies.	1a	CDEM Group Plan provides the platform for comprehensive, coordinated CDEM across its area.
				1b	Planning is integrated and aligned across the CDEM Group.
				1c	A plan is in place that outlines.
				1d	Arrangements for civil defence emergency management.
				2	CDEM planning is integrated and aligned across agencies.
				3	CDEM Group member agencies work together cooperatively and collaboratively.
				4a	Emergency operating centres (EOC/ECC) have appropriate facilities.
				4b	Emergency operating centres (EOC/ECC) are staffed adequately.
				4c	Emergency operating centres (EOC/ECC) are resourced and operated efficiently.
				5	Warning systems are in place and are maintained and effective.
				6	Communication with partner agencies can be maintained in an emergency.
					Controllers can provide effective leadership.

S.N	Tool		Objective		Key Features
				7	Critical resources can be sourced rapidly in response to an emergency.
				8a	Logistics processes are in place to manage resources effectively in an emergency.
				8b	Group welfare planning is comprehensive and coordinated.
					Local welfare planning is comprehensive and coordinated.
				9a	Welfare can be provided to affected communities in a timely, effective manner.
				9b	Lifeline utilities are coordinated in response.
				9c	
				10	A plan is in place that outlines arrangements for civil defence emergency management.
					"CDEM planning is integrated and aligned across agencies.
		C		1a	CDEM professional development programmes are implemented per organisational needs.
				1b	Exercising is effective in improving capability.
			Enhance the ability of emergency services to prepare for and manage civil defence emergencies.	2	Warning systems are in place and are maintained and effective.
					Operating facilities are identified, staffed and able to function during an emergency.
				3	Communication with partner agencies is able to be maintained in an emergency.
				4	
				5	Resources and logistics are managed effectively in response.
		D			
				6	Risk management is formal, comprehensive, and integrated throughout the organisation.
				7	Emergency management planning is collaborative and coordinated with CDEM agencies.
			Enhance the ability of lifeline utilities to prepare for and		
		E			

S.N	Tool		Objective		Key Features
			manage civil defence emergencies.	1	Emergency management planning is collaborative and coordinated with other lifeline utilities.
				2	Capability to respond to emergencies is developed and maintained.
			Enhance the ability of government agencies to prepare for and manage civil defence emergencies.	3	Response procedures are pre-determined, documented and tested.
				4	Recovery policies are planned and implemented
					A plan is in place that outline arrangements for civil defence emergency management.
				5	"CDEM planning is integrated and aligned across agencies.
				6	CDEM professional development programmes are implemented according to organisational needs.
					Exercising is effective in improving capability.
					Warning systems are in place and are maintained and effective.
		F		1a	Operating facilities are identified, staffed and able to function during an emergency.
				1b	Communication with partner agencies is able to be maintained in an emergency.
				2	Resources and logistics are managed effectively in response.
				3	System of Domestic and External Security Coordination is effective and understood.
			Improve the ability of government to manage an event of national significance	4	
				5	National CDEM Plan (and Guide to the National CDEM Plan) details arrangements for effective civil defence emergency management in KSA.
				6	National CDEM planning is inclusive of and supported by stakeholders.
				7	

S.N	Tool		Objective		Key Features
2	To reduce the risks from hazards to KSA	A	Improve the coordination, promotion and accessibility of CDEM research.	1	National Crisis Management Centre has appropriate facilities and resources in place to coordinate the national support to emergencies.
				2a	National Crisis Management Centre has staff identified and trained to be able to support 24/7 operations over at least a 2 week period.
					National Crisis Management Centre is able to respond effectively at any mode of operation.
					Statutory CDEM roles and responsibilities are identified, understood and performed.
		B		2b	National resources are coordinated to support effective response
					Arrangements are in place to request, accept and manage. international assistance in an emergency of national significance.
				3a	National Exercise Programme is effective in exercising national-level emergency events.
				3b	CDEM research is undertaken.
					CDEM research is assessed and analysed.
		C		3c	CDEM research is applied.
					Technical advisory groups are utilised.
			Develop a comprehensive understanding of KSA hazard scape.	4	
				5	Hazards, vulnerabilities and risks are identified and documented.
					Level of risk is determined in the context of existing controls.
		D		6	Risks are evaluated in the context of community goals, and priorities for treatment established.
				7	

S.N	Tool		Objective		Key Features
		A	Encourage all CDEM stakeholders to reduce the risks from hazards to acceptable levels.	1	Hazards, vulnerabilities and risks are monitored on an ongoing basis.
				2	Approach to risk is coordinated within the wider organisation, and between organisations.
				3	
				4	
		B	Improve the coordination of government policy relevant to CDEM.	1	Guiding principles for risk reduction are established.
				2	Viable risk reduction options are identified and evaluated.
				3	Implementation of risk reduction programmes is inclusive, coordinated, and monitored for progress and effectiveness.
				4	Business, household and individual risk reduction is encouraged.
		C		5	Hazard risk management is coordinated at the national level.
					Risk reduction is integrated into government policy and programmes.
					National CDEM Strategy is in place and effective in coordinating the national approach to CDEM.
		D			Clusters of agencies interact to achieve common CDEM outcomes.
			Comply with relevant legislative frameworks.	1	Compliance and promotion of the CDEM Act.
				2	Compliance with other relevant legislation.
			Implement effective organisational structures for CDEM	3	
				4	CDEM Group Joint Committee includes appropriate level representation and has formalised procedures.

S.N	Tool		Objective		Key Features
3	To ensure all agencies have the structures and authorities to be able to reduce risks, be ready for, respond to and recover from civil defence emergencies	A	Ensure agencies have funding for civil defence emergency management	1	Coordinating Executive Group includes appropriate level. representation and has formalised procedures
				2	CDEM Group governance structures are effective in managing CDEM and meeting agreed objectives
				3	CDEM Group work programmes are planned, monitored, and effective in achieving CDEM objectives
					Local authority work programmes are planned, monitored, and effective in achieving CDEM objectives.
		B	Ensure agencies are able to function to the fullest possible extent during and after an emergency	4	Funding arrangements are transparent and accounted for.
					Mechanisms are in place to be able to source emergency funding.
					Hazard reduction funding has transparent funding formulas and is prioritised to risk.
		C			Business Continuity Management programme is formalised and has high-level commitment.
		D		1	Critical business functions and processes, and potential impacts on them are defined.
				2	Strategies and principles for business continuity are determined
					BCM arrangements are developed and implemented
					BCM arrangements are exercised, maintained and reviewed
					BCM is embedded in the organisation's culture
		A	Increase the level of community awareness and understanding of the risks from hazards.	1	
				2	Public education programme on hazards and risks is planned, coordinated and given priority by the organisation.
				3	Awareness-building opportunities are proactively pursued.
					Public information management is planned, coordinated and given priority by the organisation.
				4a	

S.N	Tool		Objective		Key Features
4	To increase community awareness, understanding, preparedness and participation in civil defence emergency management		Improve individual and community preparedness.	4b	Public information manager is appointed and resourced to be able to do the job.
				1	The preparedness message is disseminated using multiple methods
				2	Levels of community resilience are monitored.
				3	
			Improve community participation in CDEM.		Volunteer participation in CDEM is supported and encouraged.
				1	Community organisations' CDEM initiatives are supported and encouraged.
					Information on hazards and risks is readily available to the public.
				2	Community input on hazard risk management is sought, and 'acceptable levels of risk' defined.
			Encourage and enable wider community participation in hazard risk management.	3	CDEM planning is integrated with other community-focused planning.
				4	
				5	
				6	Structures, roles and responsibilities for recovery are pre-determined and documented.
			Implement effective recovery planning activities		Recovery Managers are identified, trained, supported and ready to perform the role.
					Recovery Plan outlines arrangements for holistic recovery management.
5				1	Recovery planning is integrated with risk reduction and other community planning.
				2	
			Enhance the ability of agencies to manage the recovery process.	3	Arrangements for the transition from response to recovery are pre-defined.
				4	

S.N	Tool		Objective		Key Features
	To enhance KSA capability to recover from civil defence emergencies				Impact assessments are conducted before, during and after events in order to inform recovery planning and management. Plans and procedures for establishing a recovery centre or 'one-stop shop' are in place. The community is an integral part of recovery planning and management. Information management systems are effective in supporting recovery management. Processes for learning from emergencies are embedded in the organisation.

Appendix E: Focus Group Questions

Focus Group Questions

1) How can the existing response arrangements be improved and made more effective?
2) What are the necessary factors or elements that must be present in any capacity assessment framework for use in Saudi Arabia?
3) Will adding these factors mentioned motivate use and application of framework for assessment of disaster preparedness and response capabilities?
4) What other information do you wish to add or discuss?

Appendix F: Pairwise Comparison **Disaster Response Priorities**

Scale: 1 - Equal Importance, 3 - Moderate importance, 5 - Strong importance, 7 - Very strong importance, 9 - Extreme importance (2,4,6,8 values in-between).

105 pairwise comparisons. Please do the pairwise comparison of all criteria. When completed, click *Calculate Result* to get the priorities.

Which criterion with respect to *Disaster Response Priorities* is more important, and how much more on a scale 1 to 9?

	A - Importance - or B?		Equal	How much more?
1	Community Engagement	or Effectiveness of Response Plan	**1**	2 **3** 4 **5** 6 **7** 8 **9**
2	Community Engagement	or Effective Disaster Logistics	**1**	2 **3** 4 **5** 6 **7** 8 **9**
3	Community Engagement	or Inter-Organisational Structure	**1**	2 **3** 4 **5** 6 **7** 8 **9**
4	Community Engagement	or Communications (inter-org)	**1**	2 **3** 4 **5** 6 **7** 8 **9**
5	Community Engagement	or Communications (intra-org)	**1**	2 **3** 4 **5** 6 **7** 8 **9**
6	Community Engagement	or Financial Planning	**1**	2 **3** 4 **5** 6 **7** 8 **9**
7	Community Engagement	or Training of first responders	**1**	2 **3** 4 **5** 6 **7** 8 **9**

8	Community Engagement	or Regular disaster drills	**1**	2 **3** 4 **5** 6 **7** 8 **9**
9	Community Engagement	or Quick Response	**1**	2 **3** 4 **5** 6 **7** 8 **9**
10	Community Engagement	or Army Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
11	Community Engagement	or Technology Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
12	Community Engagement	or Disaster Needs Assessment	**1**	2 **3** 4 **5** 6 **7** 8 **9**
13	Community Engagement	or Continuous improvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
14	Community Engagement	or Monitoring and Control	**1**	2 **3** 4 **5** 6 **7** 8 **9**
15	Effectiveness of Response Plan	or Effective Disaster Logistics	**1**	2 **3** 4 **5** 6 **7** 8 **9**
16	Effectiveness of Response Plan	or Inter-Organisational Structure	**1**	2 **3** 4 **5** 6 **7** 8 **9**
17	Effectiveness of Response Plan	or Communications (inter-org)	**1**	2 **3** 4 **5** 6 **7** 8 **9**

18	Effectiveness of Response Plan	or Communications (intra-org)	**1**	2 **3** 4 **5** 6 **7** 8 **9**
19	Effectiveness of Response Plan	or Financial Planning	**1**	2 **3** 4 **5** 6 **7** 8 **9**
20	Effectiveness of Response Plan	or Training of first responders	**1**	2 **3** 4 **5** 6 **7** 8 **9**
21	Effectiveness of Response Plan	or Regular disaster drills	**1**	2 **3** 4 **5** 6 **7** 8 **9**
22	Effectiveness of Response Plan	or Quick Response	**1**	2 **3** 4 **5** 6 **7** 8 **9**
23	Effectiveness of Response Plan	or Army Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
24	Effectiveness of Response Plan	or Technology Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
25	Effectiveness of Response Plan	or Disaster Needs Assessment	**1**	2 **3** 4 **5** 6 **7** 8 **9**
26	Effectiveness of Response Plan	or Continuous improvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
27	Effectiveness of Response Plan	or Monitoring and Control	**1**	2 **3** 4 **5** 6 **7** 8 **9**

28	Effective Disaster Logistics	or Inter-Organisational Structure	**1**	2 **3** 4 **5** 6 **7** 8 **9**
29	Effective Disaster Logistics	or Communications (inter-org)	**1**	2 **3** 4 **5** 6 **7** 8 **9**
30	Effective Disaster Logistics	or Communications (intra-org)	**1**	2 **3** 4 **5** 6 **7** 8 **9**
31	Effective Disaster Logistics	or Financial Planning	**1**	2 **3** 4 **5** 6 **7** 8 **9**
32	Effective Disaster Logistics	or Training of first responders	**1**	2 **3** 4 **5** 6 **7** 8 **9**
33	Effective Disaster Logistics	or Regular disaster drills	**1**	2 **3** 4 **5** 6 **7** 8 **9**
34	Effective Disaster Logistics	or Quick Response	**1**	2 **3** 4 **5** 6 **7** 8 **9**
35	Effective Disaster Logistics	or Army Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
36	Effective Disaster Logistics	or Technology Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
37	Effective Disaster Logistics	or Disaster Needs Assessment	**1**	2 **3** 4 **5** 6 **7** 8 **9**

38	Effective Disaster Logistics	or Continuous improvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
39	Effective Disaster Logistics	or Monitoring and Control	**1**	2 **3** 4 **5** 6 **7** 8 **9**
40	Inter-Organisational Structure	or Communications (inter-org)	**1**	2 **3** 4 **5** 6 **7** 8 **9**
41	Inter-Organisational Structure	or Communications (intra-org)	**1**	2 **3** 4 **5** 6 **7** 8 **9**
42	Inter-Organisational Structure	or Financial Planning	**1**	2 **3** 4 **5** 6 **7** 8 **9**
43	Inter-Organisational Structure	or Training of first responders	**1**	2 **3** 4 **5** 6 **7** 8 **9**
44	Inter-Organisational Structure	or Regular disaster drills	**1**	2 **3** 4 **5** 6 **7** 8 **9**
45	Inter-Organisational Structure	or Quick Response	**1**	2 **3** 4 **5** 6 **7** 8 **9**
46	Inter-Organisational Structure	or Army Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
47	Inter-Organisational Structure	or Technology Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**

48	Inter-Organisational Structure	or Disaster Needs Assessment	**1**	2 **3** 4 **5** 6 **7** 8 **9**
49	Inter-Organisational Structure	or Continuous improvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
50	Inter-Organisational Structure	or Monitoring and Control	**1**	2 **3** 4 **5** 6 **7** 8 **9**
51	Communications (inter-org)	or Communications (intra-org)	**1**	2 **3** 4 **5** 6 **7** 8 **9**
52	Communications (inter-org)	or Financial Planning	**1**	2 **3** 4 **5** 6 **7** 8 **9**
53	Communications (inter-org)	or Training of first responders	**1**	2 **3** 4 **5** 6 **7** 8 **9**
54	Communications (inter-org)	or Regular disaster drills	**1**	2 **3** 4 **5** 6 **7** 8 **9**
55	Communications (inter-org)	or Quick Response	**1**	2 **3** 4 **5** 6 **7** 8 **9**
56	Communications (inter-org)	or Army Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
57	Communications (inter-org)	or Technology Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**

58	Communications (inter-org)	or Disaster Needs Assessment	**1**	2 **3** 4 **5** 6 **7** 8 **9**
59	Communications (inter-org)	or Continuous improvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
60	Communications (inter-org)	or Monitoring and Control	**1**	2 **3** 4 **5** 6 **7** 8 **9**
61	Communications (intra-org)	or Financial Planning	**1**	2 **3** 4 **5** 6 **7** 8 **9**
62	Communications (intra-org)	or Training of first responders	**1**	2 **3** 4 **5** 6 **7** 8 **9**
63	Communications (intra-org)	or Regular disaster drills	**1**	2 **3** 4 **5** 6 **7** 8 **9**
64	Communications (intra-org)	or Quick Response	**1**	2 **3** 4 **5** 6 **7** 8 **9**
65	Communications (intra-org)	or Army Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
66	Communications (intra-org)	or Technology Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
67	Communications (intra-org)	or Disaster Needs Assessment	**1**	2 **3** 4 **5** 6 **7** 8 **9**

68	Communications (intra-org)	or Continuous improvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
69	Communications (intra-org)	or Monitoring and Control	**1**	2 **3** 4 **5** 6 **7** 8 **9**
70	Financial Planning	or Training of first responders	**1**	2 **3** 4 **5** 6 **7** 8 **9**
71	Financial Planning	or Regular disaster drills	**1**	2 **3** 4 **5** 6 **7** 8 **9**
72	Financial Planning	or Quick Response	**1**	2 **3** 4 **5** 6 **7** 8 **9**
73	Financial Planning	or Army Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
74	Financial Planning	or Technology Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
75	Financial Planning	or Disaster Needs Assessment	**1**	2 **3** 4 **5** 6 **7** 8 **9**
76	Financial Planning	or Continuous improvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
77	Financial Planning	or Monitoring and Control	**1**	2 **3** 4 **5** 6 **7** 8 **9**

78	Training of first responders	or Regular disaster drills	**1**	2 **3** 4 **5** 6 **7** 8 **9**
79	Training of first responders	or Quick Response	**1**	2 **3** 4 **5** 6 **7** 8 **9**
80	Training of first responders	or Army Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
81	Training of first responders	or Technology Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
82	Training of first responders	or Disaster Needs Assessment	**1**	2 **3** 4 **5** 6 **7** 8 **9**
83	Training of first responders	or Continuous improvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
84	Training of first responders	or Monitoring and Control	**1**	2 **3** 4 **5** 6 **7** 8 **9**
85	Regular disaster drills	or Quick Response	**1**	2 **3** 4 **5** 6 **7** 8 **9**
86	Regular disaster drills	or Army Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
87	Regular disaster drills	or Technology Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**

88	Regular disaster drills	or Disaster Needs Assessment	**1**	2 **3** 4 **5** 6 **7** 8 **9**
89	Regular disaster drills	or Continuous improvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
90	Regular disaster drills	or Monitoring and Control	**1**	2 **3** 4 **5** 6 **7** 8 **9**
91	Quick Response	or Army Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
92	Quick Response	or Technology Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
93	Quick Response	or Disaster Needs Assessment	**1**	2 **3** 4 **5** 6 **7** 8 **9**
94	Quick Response	or Continuous improvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
95	Quick Response	or Monitoring and Control	**1**	2 **3** 4 **5** 6 **7** 8 **9**
96	Army Involvement	or Technology Involvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**

97	Army Involvement	or Disaster Needs Assessment	**1**	2 **3** 4 **5** 6 **7** 8 **9**
98	Army Involvement	or Continuous improvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
99	Army Involvement	or Monitoring and Control	**1**	2 **3** 4 **5** 6 **7** 8 **9**
100	Technology Involvement	or Disaster Needs Assessment	**1**	2 **3** 4 **5** 6 **7** 8 **9**
101	Technology Involvement	or Continuous improvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
102	Technology Involvement	or Monitoring and Control	**1**	2 **3** 4 **5** 6 **7** 8 **9**
103	Disaster Needs Assessment	or Continuous improvement	**1**	2 **3** 4 **5** 6 **7** 8 **9**
104	Disaster Needs Assessment	or Monitoring and Control	**1**	2 **3** 4 **5** 6 **7** 8 **9**
105	Continuous improvement	or Monitoring and Control	**1**	2 **3** 4 **5** 6 **7** 8 **9**